Steven M. Snider
Vice President
Oconee Nuclear Station

Duke Energy
ON01VP | 7800 Rochester Hwy
Seneca, SC 29672
o: 864.873.3478
f: 864.873.5791

Steve.Snider@duke-energy.com

RA-21-0132
June 7, 2021

10 CFR 50.4
10 CFR Part 54

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852

Subject: Duke Energy Carolinas, LLC (Duke Energy)
Oconee Nuclear Station (ONS), Units 1, 2, and 3
Docket Numbers 50-269, 50-270, 50-287
Renewed License Numbers DPR-38, DPR-47, DPR-55
Application for Subsequent Renewed Operating Licenses

Ladies and Gentlemen:

Pursuant to the *Code of Federal Regulations,* Title 10, Parts 50, 51, and 54, Duke Energy Carolinas, LLC (Duke Energy) is submitting this application for Subsequent Renewed Operating Licenses for Oconee Nuclear Station (ONS) Units 1, 2, and 3. The existing Renewed Facility Operating Licenses, Numbers DPR-38, DPR-47, and DPR-55, are currently set to expire as follows:

- At midnight on February 6, 2033, for Oconee Nuclear Station Unit 1 (Renewed Facility Operating License Number DPR-38).
- At midnight on October 6, 2033, for Oconee Nuclear Station Unit 2 (Renewed Facility Operating License Number DPR-47).
- At midnight on July 19, 2034, for Oconee Nuclear Station Unit 3 (Renewed Facility Operating License Number DPR-55).

Duke Energy seeks to extend the respective operating terms by 20 years beyond the current renewal licensed expiration dates.

The enclosed Subsequent License Renewal Application contains the information required by 10 CFR Parts 54 and 51 and meets the submittal timeliness requirements of 10 CFR 54.17(c) and 10 CFR 2.109(b). This submittal provides appropriate administrative, technical and environmental information sufficient to support NRC findings required by 10 CFR 54.29.

This application has been prepared, to the extent feasible, in a format compatible with NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants," Regulatory Guide 1.188, Revision 2 "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," and guidance provided by Nuclear Energy Institute 17-01, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal."

Enclosure 5 contains information that is being withheld from public disclosure under 10 CFR 2.390. Upon separation from Enclosure 5, this letter is decontrolled.

As required by 10 CFR 54.21(b), current licensing basis changes which have a material effect on the content of this application will be submitted at least annually while the application is under NRC review and at least three months prior to the scheduled completion of the NRC review.

Appendix A, Table A6.0-1, “Subsequent License Renewal Commitments”, of the enclosed Oconee Nuclear Station Subsequent License Renewal Application provides a list of commitments made in this application. This list will be updated as required throughout the SLRA review process.

The Application for Subsequent Renewed Operating Licenses for ONS Units 1, 2, and 3 consists of the following five Enclosures:

Enclosure 1: Oconee Nuclear Station Subsequent License Renewal Application Enclosure Summary (details of the contents of each enclosure)
Enclosure 2: Application for Withholding Proprietary Information from Public Disclosure Pursuant to 10 CFR 2.390
Enclosure 3: Oconee Nuclear Station Subsequent License Renewal Application
Enclosure 4: Non-proprietary Reference Documents and a Redacted Version of a Proprietary Reference Document (Public Version)
Enclosure 5: 10 CFR 2.390 Withheld Proprietary Documents (Non-Public Version)

Since Enclosure 5 contains proprietary information, it is supported by an affidavit signed by the owner of the information (Enclosure 2). The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in 10 CFR 2.390(b)(4) and consistent with NRC Regulatory Issue Summary 2014-11, Regulatory Requirements for Withholding of Proprietary Information form Public Disclosure. Accordingly, it is respectfully requested that the proprietary information be withheld from public disclosure in accordance with 10 CFR 2.390. A redacted, non-proprietary version is provided in Enclosure 4 as noted above. Correspondence with respect to the copyright or proprietary aspects of the vendor information or affidavits should be addressed to the vendor representative identified in the respective affidavit.

The NRC has issued four Interim Staff Guidance documents that update aging management criteria for pressurized-water reactor vessel internal components, mechanical, structural, and electrical structures and components in the NRC’s subsequent license renewal guidance documents. Specifically, the Interim Staff Guidance documents revise guidance contained in NUREG–2191, ‘‘Generic Aging Lessons Learned for Subsequent License Renewal (GALL–SLR) Report,’’ and NUREG–2192, ‘‘Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants.’’ These Interim Staff Guidance documents are intended to facilitate preparation of subsequent license renewal applications by clarifying existing guidance for aging management and adding new guidance, which also will facilitate the NRC staff’s review of subsequent license renewal applications. The information in the Subsequent License Renewal Interim Staff Guidance documents has been incorporated into the SLRA where applicable.

1. SLR–ISG–2021–01–PWRVI, “Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors”, (ADAMS Accession Number ML20217L203).
2. SLR–ISG–2021–02–MECHANICAL, “Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance”, (ADAMS Accession Number ML20181A434).

3. SLR–ISG–2021–03–STRUCTURES, “Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance”, (ADAMS Accession Number ML20181A381).
4. SLR–ISG–2021–04–ELECTRICAL, “Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance”, (ADAMS Accession Number ML20181A395).

Should you have any questions regarding this submittal, please contact Paul Guill at (704) 382 4753 or by email at paul.guill@duke-energy.com.

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 7, 2021.

Sincerely,

Steven M. Snider
Site Vice President
Oconee Nuclear Station

Enclosures:

Enclosure 1: Oconee Nuclear Station Subsequent License Renewal Application Enclosure Summary

Enclosure 2: Application for Withholding Proprietary Information from Public Disclosure Pursuant to 10 CFR 2.390

Attachment 1: Affidavit for Framatome Topical Reports ANP 3898P, Revision 0 and ANP 3899P, Revision 0
Attachment 2: Framatome Affidavit for SLR-ONS-TLAA-0306P, Revision 0
Attachment 3: Duke Energy Affidavit for SLR-ONS-TLAA-0306P-NP, Revision 0

Enclosure 3: Oconee Nuclear Station Subsequent License Renewal Application

Attachment 1: Subsequent License Renewal Application (Safety Report)
Attachment 2: Subsequent License Renewal Application, Appendix E, Environmental Report

Enclosure 4: Non-proprietary Reference Documents and a Redacted Version of a Proprietary Reference Document (Public Version)

Attachment 1: Framatome Topical Report ANP 3898NP, Revision 0
Attachment 2: Framatome Topical Report ANP 3899NP, Revision 0
Attachment 3: SLR-ONS-TLAA-0306NP, Revision 0

Enclosure 5: 10 CFR 2.390 Withheld Proprietary Reference Documents (Non-Public Version)

Attachment 1: Framatome Topical Report ANP 3898P, Revision 0
Attachment 2: Framatome Topical Report ANP 3899P, Revision 0
Attachment 3: SLR-ONS-TLAA-0306P, Revision 0

CC: W/O Enclosures:

Laura A. Dudes Regional Administrator
U.S. Nuclear Regulatory Commission – Region II
Marquis One Tower
245 Peachtree Center Ave., NE Suite 1200
Atlanta, Georgia 30303-1257

Angela X. Wu, Project manager
(by electronic mail only)
U.S. Nuclear Regulatory Commission
Mail Stop 11 G3
11555 Rockville Pike
Rockville, Maryland 20852

Lance J. Rakovan, Project Manager
(by electronic mail only)
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852

Shawn A. Williams, Project Manager
(by electronic mail only)
U.S. Nuclear Regulatory Commission
Mail Stop 8 B1A
11555 Rockville Pike
Rockville, Maryland 20852

Jared Nadel
(by electronic mail only)
NRC Senior Resident Inspector
Oconee Nuclear Station

Anuradha Nair-Gimmi,
(by electronic mail only: naira@dhec.sc.gov)
Bureau Environmental Health Services
Department of Health & Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

BCC: W/O Enclosures:

T.P. Gillespie
K. Henderson
S. Capps
T.M. Hamilton
P.V. Fisk
H.T. Grant
S.A. Dalton
M.C. Nolan
A.H. Zaremba
S. Snider
R.K. Nader
G.D. Robison
A.H. Pifer
T.M. LeRoy
A. Kapur
P.F. Guill
R. Gambrell
File: (Corporate)
Electronic Licensing Library (ELL)

Enclosure 1

OCONEE NUCLEAR STATION
SUBSEQUENT LICENSE RENEWAL APPLICATION
ENCLOSURE SUMMARY

ENCLOSURE SUMMARY

Enclosure 1: Oconee Nuclear Station Subsequent License Renewal Application Enclosure Summary

Enclosure 2: Application for Withholding Proprietary Information from Public Disclosure Pursuant to 10 CFR 2.390

Attachment 1: Affidavit for Framatome Topical Reports ANP 3898NP, Revision 0 and ANP 3899NP, Revision 0
Attachment 2: Affidavit for SLR-ONS-TLAA-0306NP, Revision 0

Enclosure 3: Oconee Nuclear Station Subsequent License Renewal Application

Attachment 1: Subsequent License Renewal Application (Safety Report)
Attachment 2: Subsequent License Renewal Application, Appendix E, Environmental Report

Enclosure 4: Non-proprietary Reference Documents and a Redacted Version of a Proprietary Reference Document (Public Version)

Attachment 1: Framatome Topical Report ANP 3898NP, Revision 0, "Framatome Reactor Vessel TLAA and Aging Management Review Input to the ONS SLRA," May 2021
Attachment 2: Framatome Topical Report ANP 3899NP, Revision 0, "Framatome Reactor Vessel Internals TLAA Input to the ONS SLRA," May 2021
Attachment 3: SLR-ONS-TLAA-0306NP, Revision 0, "Environmentally-Assisted Fatigue Oconee Subsequent License Renewal Application Supplemental Section 4.3.4"

Enclosure 5: 10 CFR 2.390 Withheld Proprietary Reference Documents (Non-Public Version)

Attachment 1: Framatome Topical Report ANP 3898P, Revision 0, "Framatome Reactor Vessel TLAA and Aging Management Review Input to the ONS SLRA," May 2021
Attachment 2: Framatome Topical Report ANP 3899P, Revision 0, "Framatome Reactor Vessel Internals TLAA Input to the ONS SLRA," May 2021
Attachment 3: SLR-ONS-TLAA-0306P, Revision 0, "Environmentally-Assisted Fatigue Oconee Subsequent License Renewal Application Supplemental Section 4.3.4"

Enclosure 2

OCONEE NUCLEAR STATION
APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATON
FROM PUBLIC DISCLOSURE PURSUANT TO 10 CFR 2.390

ENCLOSURE 2
ATTACHMENT 1

OCONEE NUCLEAR STATION
AFFIDAVIT FOR FRAMATOME TOPICAL REPORTS ANP 3898P, REVISION 0 AND ANP 3899P, REVISION 0

A F F I D A V I T

1. My name is Philip A. Opsal. I am Manager, Product Licensing for Framatome Inc. (formally known as AREVA Inc.), and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by Framatome to determine whether certain Framatome information is proprietary. I am familiar with the policies established by Framatome to ensure the proper application of these criteria.

3. I am familiar with the Framatome information contained in the following documents referred to herein as "Documents":

- Framatome Document ANP-3898P, Revision 0, "Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA"
- Framatome Document ANP-3899P, Revision 0, "Framatome Reactor Vessel Internals TLAA Input to the ONS SLRA"

Information contained in these Documents has been classified by Framatome as proprietary in accordance with the policies established by Framatome for the control and protection of proprietary and confidential information.

4. These Documents contain information of a proprietary and confidential nature and is of the type customarily held in confidence by Framatome and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in these Documents as proprietary and confidential.

5. These Documents have been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in these Documents be withheld from public disclosure. The request for withholding of proprietary information is

made in accordance with 10 CFR 2.390. The information for which withholding from disclosure is requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information."

6. The following criteria are customarily applied by Framatome to determine whether information should be classified as proprietary:

(a) The information reveals details of Framatome's research and development plans and programs or their results.

(b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.

(c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for Framatome.

(d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for Framatome in product optimization or marketability.

(e) The information is vital to a competitive advantage held by Framatome, would be helpful to competitors to Framatome, and would likely cause substantial harm to the competitive position of Framatome.

The information in these Documents is considered proprietary for the reasons set forth in paragraphs 6(b), 6(c), 6(d) and 6(e) above.

7. In accordance with Framatome's policies governing the protection and control of information, proprietary information contained in these Documents has been made available, on a limited basis, to others outside Framatome only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. Framatome policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on May 6, 2021.

Philip A. Opsal

ENCLOSURE 2
ATTACHMENT 2

OCONEE NUCLEAR STATION
FRAMATOME AFFIDAVIT FOR SLR-ONS-TLAA-0306P, REVISION 0

A F F I D A V I T

1. My name is Philip A. Opsal. I am Manager, Product Licensing for Framatome Inc. (formally known as AREVA Inc.), and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by Framatome to determine whether certain Framatome information is proprietary. I am familiar with the policies established by Framatome to ensure the proper application of these criteria.

3. I am familiar with the Framatome information contained in the Oconee Nuclear Station Units 1,2 and 3, SLR-ONS-TLAA-0306P, Environmentally-Assisted Fatigue, Oconee Subsequent License Renewal Application, Supplemental Section 4.3.4, Revision 0 referred to herein as "Document." Information contained in this Document has been classified by Framatome as proprietary in accordance with the policies established by Framatome for the control and protection of proprietary and confidential information.

4. This Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by Framatome and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in this Document as proprietary and confidential.

5. This Document has been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in this Document be withheld from public disclosure. The request for withholding of proprietary information is made in accordance with 10 CFR 2.390. The information for which withholding from disclosure is requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information."

6. The following criteria are customarily applied by Framatome to determine whether information should be classified as proprietary:

(a) The information reveals details of Framatome's research and development plans and programs or their results.

(b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.

(c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for Framatome.

(d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for Framatome in product optimization or marketability.

(e) The information is vital to a competitive advantage held by Framatome, would be helpful to competitors to Framatome, and would likely cause substantial harm to the competitive position of Framatome.

The information in this Document is considered proprietary for the reasons set forth in paragraphs 6(b), 6(d) and 6(e) above.

7. In accordance with Framatome's policies governing the protection and control of information, proprietary information contained in this Document has been made available, on a limited basis, to others outside Framatome only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. Framatome policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on May 14, 2021

Philip A. Opsal

ENCLOSURE 2
ATTACHMENT 3

OCONEE NUCLEAR STATION
DUKE ENERGY AFFIDAVIT FOR SLR-ONS-TLAA-0306P-NP, REVISION 0

AFFIDAVIT OF STEVE SNIDER

1. I am Site Vice President, Oconee, Duke Energy Carolinas, LLC ("Duke Energy"), and as such have the responsibility of reviewing proprietary information sought to be withheld from public disclosure in connection with nuclear plant licenses and am authorized to apply for its withholding on behalf of Duke Energy.

2. I am making this affidavit in conformance with the provisions of 10 CFR 2.390 of the regulations of the Nuclear Regulatory Commission ("NRC") and in conjunction with Duke Energy's application for withholding which accompanies this affidavit.

3. I have knowledge of the criteria used by Duke Energy in designating information as proprietary or confidential. I am familiar with the Duke Energy information contained in Table 4.3.4-1 of Attachment 3 to Enclosures 4 and 5 of the Oconee Subsequent License Renewal submittal.

4. Pursuant to the provisions of 10 CFR 2.390(b)(4), the following is furnished for consideration by the NRC in determining whether the information sought to be withheld from public disclosure should be withheld.

   (i) The information sought to be withheld from public disclosure is owned by Duke Energy and has been held in confident by Duke Energy and its consultants.

   (ii) The information is of a type that would customarily be held in confidence by Duke Energy. Information is held in confidence if it falls in one or more of the following categories.

      (a) The information requested to be withheld reveals distinguishing aspects of a process (or component, structure, tool, method, etc.) whose use by a vendor or consultant, without a license from Duke Energy, would constitute a competitive economic advantage to that vendor or consultant.

      (b) The information requested to be withheld consist of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), and the application of the data secures a competitive economic advantage for example by requiring the vendor or consultant to perform test measurements, and process and analyze the measured test data.

      (c) Use by a competitor of the information requested to be withheld would reduce in the competitor's expenditure of resources, or improve its competitive position, in the design, manufacture, shipment, installation assurance of quality or licensing of a similar product.

(d) The information requested to be withheld reveals cost or price information, productive capacities, budget levels or commercial strategies of Duke Energy or its customers or suppliers.

(e) The information requested to be withheld reveals aspect of the Duke Energy funded (either wholly or as part of a consortium) development plans or programs of commercial value to Duke Energy.

(f) The information requested to be withheld consists of patentable ideas.

The information in this submittal is held in confidence for the reasons set forth in paragraphs 4(ii)(a), 4(ii)(b), and 4(ii)(c) above. Rationale for this declaration is the use of this information by Duke Energy provides a competitive advantage to Duke Energy over vendors and consultants, its public disclosure would diminish the information's marketability, and its use by a vendor or consultant would reduce their expenses to duplicate similar information. The information consist of analysis methodology detains that provides a competitive advantage to Duke Energy.

(iii) The information was transmitted to the NRC in confidence under the provisions of 10 CFR 2.390, it is to be received in confidence by the NRC.

(iv) The information sought to be protected is not available in public to the best of our knowledge and belief.

(v) The proprietary information sought to be withheld is that which is marked in Table 4.3.4-1 of Attachment 3 to Enclosures 4 and 5 of the Oconee Subsequent License Renewal submittal. This information enables Duke Energy to support the Oconee Subsequent License Renewal Application.

(vi) The proprietary information sought to be withheld from public disclosure has substantial commercial value to Duke Energy.

(a) Duke Energy uses this information to reduce vendor and consultant expenses associated with supporting the operation and licensing of nuclear plants.

(b) The subject information could only be duplicated by competitors at similar expense to that incurred by Duke Energy.

5. Public disclosure of this information is likely to cause harm to Duke Energy because it would allow competitors in the nuclear industry to benefit from the results of a significant development program without requiring a commensurate expense of allowing Duke Energy to recoup a portion of its expenditures or benefit from the sale of the information.

Steve Snider affirms that he is the person who subscribed his name to the foregoing statement, and that all matters and facts set forth herein are true and correct to the best of his knowledge.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on May 18, 2021.

Steve Snider

ENCLOSURE 3

OCONEE NUCLEAR STATION
SUBSEQUENT LICENSE RENEWAL APPLICATION

ENCLOSURE 3
Attachment 1

OCONEE NUCLEAR STATION
Subsequent License Renewal Application (Safety Report)

Oconee Nuclear Station

Units 1, 2 and 3

Application for Subsequent License Renewal

June 7, 2021

Intentionally Blank

List of Appendices

List of Tables

List of Figures

1.0 ADMINISTRATIVE INFORMATION

1.1 GENERAL INFORMATION - 10 CFR 54.19

1.1.1 NAME OF APPLICANT

Duke Energy Carolinas, LLC (Duke Energy) hereby applies for subsequent renewed facility operating licenses for Oconee Nuclear Station (ONS), Units 1, 2, and 3.

1.1.2 ADDRESS OF APPLICANT

Duke Energy Carolinas, LLC
526 South Church Street
Charlotte, North Carolina 28202-1803

1.1.3 ADDRESS OF OCONEE NUCLEAR STATION

Duke Energy Carolinas, LLC
Oconee Nuclear Station
7800 Rochester Highway
Seneca, South Carolina 29672

1.1.4 DESCRIPTION OF BUSINESS OR OCCUPATION OF APPLICANT

Duke Energy is a limited liability company duly organized and existing under the laws of the State of North Carolina (NC) and is qualified to do business in the State of South Carolina (SC). Duke Energy is engaged in the business of generating, transmitting, distributing and selling electric power and energy. Duke Energy is a “public utility” under the laws of NC and SC. Duke Energy is subject to the jurisdiction of the North Carolina Utilities Commission (NCUC) with respect to its operations in that State. The company also transacts business and is an “electrical utility” under the laws of the State of SC; accordingly, its operations in that state are subject to the jurisdiction of the Public Service Commission of South Carolina (PSCSC). The company owns and operates regulated electric facilities, including seven (7) nuclear units licensed by the Nuclear Regulatory Commission (NRC), as well as electric distribution and transmission facilities.

The initial Oconee Nuclear Station Units renewed facility operating licenses will expire as follows:

- At midnight on February 6, 2033, for Oconee Nuclear Station Unit 1 (Renewed Facility Operating License Number DPR-38).
- At midnight on October 6, 2033, for Oconee Nuclear Station Unit 2 (Renewed Facility Operating License Number DPR-47).
- At midnight on July 19, 2034, for Oconee Nuclear Station Unit 3 (Renewed Facility Operating License Number DPR-55).

Duke Energy will continue as the licensed operator for the subsequent renewed facility operating licenses.

1.1.5 DESCRIPTION OF ORGANIZATION AND MANAGEMENT OF APPLICANT

Duke Energy is not owned, controlled, or dominated by any alien, foreign corporation, or foreign government. Duke Energy makes this subsequent license renewal application (SLRA) on its own behalf and is not acting as an agent or representative of any other person.

The names and business addresses of Duke Energy's Board of Directors and Principal Officers as of April 30, 2021 are listed below in Table 1.1-1 and Table 1.1-2, respectively. All persons listed are U.S. citizens.

Table 1.1-1 Names and Addresses of the Board of Directors

Name	Title	Address
Lynn J. Good	Director	Duke Energy Carolinas, LLC Mail Code DEC48D 550 South Tryon Street Charlotte, NC 28202
Dhiaa M. Jamil	Director	Duke Energy Carolinas, LLC Mail Code DEC48G 550 South Tryon Street Charlotte, NC 28202
Julia Janson	Director	Duke Energy Carolinas, LLC Mail Code DEC48A 550 South Tryon Street Charlotte, NC 28202

Table 1.1-2 Names and Addresses of Principal Officers

Name	Title	Address
Lynn J. Good	Chairman, President and Chief Executive Officer	Duke Energy Carolinas, LLC Mail Code DEC48D 550 South Tryon Street Charlotte, NC 28202
Kodwo Ghartey-Tagoe	Executive Vice President, Chief Legal Officer and Corporate Secretary	Duke Energy Carolinas, LLC Mail Code DEC48A 550 South Tryon Street Charlotte, NC 28202

Table 1.1-2 Names and Addresses of Principal Officers

Name	Title	Address
Dhiaa M. Jamil	Executive Vice President and Chief Operating Officer	Duke Energy Carolinas, LLC Mail Code DEC48G 550 South Tryon Street Charlotte, NC 28202
Douglas F. Esamann	Executive Vice President, Energy Solutions and President, Midwest and Florida Regions and Natural Gas Business	Duke Energy Carolinas, LLC Mail Code DEC48C 550 South Tryon Street Charlotte, NC 28202
Steven K. Young	Executive Vice President and Chief Financial Officer	Duke Energy Carolinas, LLC Mail Code DEC48A 550 South Tryon Street Charlotte, NC 28202
Julia S. Janson	Executive Vice President, External Affairs and President, Carolinas Region	Duke Energy Carolinas, LLC Mail Code DEC48A 550 South Tryon Street Charlotte, NC 28202
T. Preston Gillespie, Jr.	Senior Vice President and Chief Generation Officer	Duke Energy Carolinas, LLC Mail Code EC03XP 526 South Church Street Charlotte, NC 28202
Kelvin Henderson	Senior Vice President and Chief Nuclear Officer	Duke Energy Carolinas, LLC Mail Code EC03XP 526 South Church Street Charlotte, NC 28202
Karl Newlin	Senior Vice President, Corporate Development and Treasurer	Duke Energy Carolinas, LLC Mail Code DEC40A 550 South Tryon Street Charlotte, NC 28202
Brian Savoy	Senior Vice President, Chief Transformation and Administrative Officer	Duke Energy Carolinas, LLC Mail Code DEC47C 550 South Tryon Street Charlotte, NC 28202

Table 1.1-2 Names and Addresses of Principal Officers

Name	Title	Address
Dwight Jacobs	Senior Vice President, Chief Accounting Officer, Tax and Controller	Duke Energy Carolinas, LLC Mail Code DEC44A 550 South Tryon Street Charlotte, NC 28202
Harry Sideris	Executive Vice President, Customer Experience, Solutions, and Services	Duke Energy Carolinas, LLC Mail Code DEC47B 550 South Tryon Street Charlotte, NC 28202
Steven D. Capps	Senior Vice President - Nuclear Operations (SC)	Duke Energy Carolinas, LLC Mail Code EC07H 526 South Church Street Charlotte, NC 28202
Benjamin Waldrep	Senior Vice President - Nuclear Operations (NC)	Duke Energy Carolinas, LLC Mail Code EC03XP 400 South Church Street Charlotte, NC 28202
Tanya Hamilton	Senior Vice President - Nuclear Corporate	Duke Energy Carolinas, LLC Mail Code EC07H 550 South Tryon Street Charlotte, NC 28202
Steve Snider	Site Vice President - Oconee Nuclear Station	Duke Energy Carolinas, LLC Mail Code ON1VP Oconee Nuclear Station 7800 Rochester Highway Seneca, SC 29672

1.1.6 CLASS OF LICENSE, USE OF FACILITY AND PERIOD OF TIME FOR WHICH THE LICENSE IS SOUGHT

Duke Energy requests subsequent renewal of the operating licenses issued under Section 104b of the Atomic Energy Act of 1954, as amended, for ONS Unit 1, Unit 2, and Unit 3 (License Numbers DPR-38, DPR-47 and DPR-55, respectively), for a period of 20 years beyond the expiration of the initial renewed facility operating licenses. This would extend the renewed facility operating license as follows:

- Oconee Nuclear Station Unit 1 from midnight on February 6, 2033, to midnight on February 6, 2053.
- Oconee Nuclear Station Unit 2 from midnight on October 6, 2033, to midnight on October 6, 2053.
- Oconee Nuclear Station Unit 3 from midnight on July 19, 2034, to midnight on July 19, 2054.

This SLRA includes a request for renewal of those NRC source material, special nuclear material, and by-product material licenses that are subsumed into or combined with the current renewed operating licenses and that were issued pursuant to Chapter 10 of the Code of Federal Regulations (CFR) Parts 30, 40, and 70. The facility will continue to be known as ONS and will continue to generate electric power during the subsequent license renewal (SLR) period.

1.1.7 EARLIEST AND LATEST DATES FOR ALTERATIONS

Duke Energy proposes to implement a modification to abandon the buried copper alloy instrument air system piping (Section 2.3.3.1.4) within the scope of the *Buried and Underground Piping and Tanks* (B2.1.26) program on a schedule established in Table A6.0-1.

1.1.8 RESTRICTED DATA

Regarding the requirements of 10 CFR 54.17(f), this application does not contain any “Restricted Data,” as that term is defined in the Atomic Energy Act of 1954, as amended, or other defense information, and it is not expected that any such information will be part of the licensed activities.

In accordance with the requirements of 10 CFR 54.17(g), the applicant will not permit any individual to have access to or any facility to possess restricted data or classified national security information until the individual and/or facility has been approved for such access under the provisions of 10 CFR Parts 25 and/or 95.

1.1.9 REGULATORY AGENCIES

The Federal Energy Regulatory Commission, United States Securities and Exchange Commission, NCUC, and PSCSC are the principal regulators of Duke Energy’s electric operations in NC and SC. The names and addresses of these regulatory agencies are as follows:

Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

United States Securities and Exchange Commission
100 F Street NE
Washington, DC 20549

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building 5th Floor
Raleigh, NC 27603-5918

Public Service Commission of South Carolina
101 Executive Center Drive, Suite 100.
Columbia, SC 29210

1.1.10 LOCAL NEWS PUBLICATIONS

News publications in circulation near ONS that are considered appropriate to give reasonable notice of the SLRA include:

The Journal
Eagle Media
210 W. N. 1st St.,
Seneca, SC 29678

Anderson Independent
P.O. Box 2507
Anderson, SC 29621

WGOG (101.7 FM)
P.O. Box 10
Walhalla, SC 29691

WSNW (94.1 FM)
103 Ram Cat Alley
Seneca, SC 29679

1.1.11 CONFORMING CHANGES TO STANDARD INDEMNITY AGREEMENT

10 CFR 54.19(b) requires that “each application must include conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license.” The current indemnity agreement (No. B-44) for ONS states, in Article VII, that the agreement “shall terminate at the time of expiration of that license specified in Item 3 of the Attachment.” Item 3 of the Attachment to the indemnity agreement, as updated in Amendment 16, lists license number DPR-38 (for ONS Unit 1), DPR-47 (for ONS Unit 2) and

DPR-55 (for ONS Unit 3). Duke Energy has reviewed the original Indemnity Agreement and the Amendments. Neither Article VII nor Item 3 of the Attachment specifies an expiration date for license numbers DPR-38, DPR-47 and DPR-55. Therefore, no changes to the Indemnity Agreement are deemed necessary as part of this application. Should the license numbers be changed by NRC upon issuance of the subsequent renewed licenses, Duke Energy requests that the NRC amend the Indemnity Agreement to include conforming changes to Item 3 of the Attachment and other affected sections of the Agreement.

1.2 GENERAL LICENSE INFORMATION

1.2.1 APPLICATION UPDATES, RENEWED LICENSE AND RENEWAL TERM OPERATION

In accordance with 10 CFR 54.21(b), during NRC review of this SLRA, an annual update to the application to reflect any change to the current licensing basis (CLB) that materially affects the content of the SLRA will be provided.

In accordance with 10 CFR 54.21(d), Duke Energy will maintain a summary description in the ONS Updated Final Safety Analysis Report (UFSAR) of programs and activities that are required to manage the effects of aging for the systems, structures or components during the subsequent period of extended operation (SPEO) and summaries of the time-limited aging analyses (TLAA) evaluations.

1.2.2 INCORPORATION BY REFERENCE

Except for the following three instances in the Environmental Report, there are no documents incorporated by reference as part of the SLRA:

- The analyses for certain impacts codified by rulemaking (61 FR 28483) for Category 1 issues
- The findings in NUREG-1437, Revision 1, for the applicable issues
- The NRC findings for the 53 Category 1 issues that apply to ONS (plus the one uncategorized issue for which the NRC came to no generic conclusion)

Other document references, either in text or in general references provided in Sections 1 and 4, are listed for information only.

1.2.3 CONTACT INFORMATION

Any notices, questions, or correspondence regarding this filing should be directed to:

Steve Snider
Site Vice President - Oconee Nuclear Station
Oconee Nuclear Station
7800 Rochester Highway
Seneca, SC 29672

with copies to:

Steve Capps
Senior Vice President Nuclear Operations (SC)
Duke Energy Carolinas, LLC
526 South Church Street
Charlotte, NC 28202

Tanya Hamilton
Senior Vice President Nuclear Corporation
Duke Energy Carolinas, LLC
550 South Tryon Street
Charlotte, NC 28202

Rounette Nader
Director Nuclear Engineering
Duke Energy Carolinas, LLC
526 South Church Street
Charlotte, NC 28202

Tracey LeRoy
Associated General Counsel, Nuclear Legal Support
Duke Energy Carolinas, LLC
550 South Tryon Street
Charlotte, NC 28202

Kathryn M. Sutton, Esq.
Morgan Lewis & Bockius LLP
1111 Pennsylvania Ave NW
Washington, DC 20004

1.3 PURPOSE

This document provides information required by 10 CFR Part 54 to support the SLRA for ONS, Units 1, 2, and 3. The application contains technical information required by 10 CFR 54.21 and environmental information required by 10 CFR 54.23. The information contained herein is intended to provide the NRC with an adequate basis to make the findings required by 10 CFR 54.29.

1.4 DESCRIPTION OF THE PLANT

Descriptions of ONS and two of its major facilities, Keowee hydroelectric station and standby shutdown facility, are provided as background. The description of ONS is provided in Section 1.4.1. The emergency power source for ONS is provided by Keowee hydroelectric station which is described in Section 1.4.2. The standby shutdown facility, which was installed after the initial plant licensing, is located adjacent to ONS Unit 2 and is described in Section 1.4.3.

1.4.1 DESCRIPTION OF OCONEE NUCLEAR STATION

ONS is in Oconee County in northwestern SC, approximately 8 miles northeast of Seneca, SC at latitude 34°-47'-38.2” North and longitude 82°-53'- 55.4" West. ONS is situated on the shore of Lake Keowee. Lake Keowee was formed by impounding the water of the Little River and the Keowee River. Duke Energy’s Lake Keowee occupies the area immediately north and west of the site. The United States Army Corps of Engineer's Hartwell Reservoir is south of the site. Duke Energy's Lake Jocassee lies approximately 11 miles to the north.

Construction of ONS 1, 2, and 3 was authorized by the United States Atomic Energy Commission (USAEC) by issuance of construction permits CPPR-33, 34, and 35, on November 6, 1967, in Dockets 50-269, 270, and 287. The three-unit nuclear station was constructed from 1967 to 1974. Operation of ONS 1, 2, and 3 was authorized by the USAEC by issuance of operating licenses DPR-38, 47, and 55 on February 6, 1973, October 6, 1973, and July 19, 1974, respectively. Each unit consists of a Babcock & Wilcox (B&W) pressurized water reactor (PWR) nuclear steam supply system (NSSS) designed to generate 2568 megawatt (MW) thermal, or approximately 860 MW electric. The NSSS is a pressurized water type using chemical shim and control rods for reactivity control. B&W supplied the NSSS and the initial fuel cores and some reloads. Framatome Inc., as successor to B&W, supplies reloads for each of the three units. Replacement steam generators and reactor vessel heads were supplied by Babcock & Wilcox Canada (BWC).

The three units share a common design except for certain auxiliary systems which are shared. Sharing of these systems and components is not detrimental to the safe operation of any unit. General arrangements of major equipment and structures, including the reactor building, auxiliary building, and turbine building, are provided in UFSAR Figures 1-2 through 1-9.

The ONS units are generally similar to those of other current PWRs. Differences include the generation of superheated steam in once through steam generators, the use of Keowee hydroelectric station as an emergency power source, and the use of the standby shutdown facility for use under certain emergency conditions.

ONS consists of three individual reactor buildings, a common turbine building serving all three units, a shared auxiliary building for Units 1 and 2, and a Unit 3 auxiliary building. The reactor and NSSS for each unit are contained within its respective reactor building.

In 1990, Duke Energy received a Part 72 license from the NRC that permitted the construction and operation of an independent spent fuel storage installation at ONS. Materials License Number SNM-2503 was issued to Duke Energy on January 29, 1990 and was renewed on May 29, 2009. In addition, Duke Energy notified the NRC by letter dated November 7, 1996, of its intent to store spent fuel under the general license pursuant to 10 CFR 72.210 (NRC Certificate of Compliance No. 1004). Because the ONS independent spent fuel storage installation is a separately licensed facility (site specific license and general license), it is not within the scope of review as defined by 10 CFR Part 54.

1.4.2 DESCRIPTION OF KEOWEE HYDROELECTRIC STATION

The onsite emergency power source for ONS is Keowee hydroelectric station, which is located at the Keowee dam on Lake Keowee within the owner controlled area for ONS. Keowee was initially licensed (Project Number 2503) by the Federal Power Commission (now the Federal Energy Regulatory Commission) on September 26, 1966, with a license term of fifty years. A renewed license for Keowee was issued by the Federal Energy Regulatory Commission on August 16, 2016 (effective September 1, 2016) with a license term of thirty years.

The station consists of two hydroelectric units that generate electricity at 13.8 kilovolt (kV) and are rated at 87.5 megavolt amp (MVA) each. Electricity is supplied from both Keowee hydroelectric station units to ONS through two separate and independent power paths. One route is through buried cables to transformer CT4; the other route is through a 230 kV overhead transmission line, through the 230 kV switchyard at ONS, to transformers CT1, CT2, and CT3.

The Keowee hydroelectric station units are located in a building that contains all of the necessary systems and components for the units to operate. Remote startup controls and monitoring instrumentation are located in the ONS control rooms. Except for the common penstock, each Keowee hydroelectric station unit is independent of the other unit including separate electrical and mechanical support systems. The integrated plant assessments (IPAs) of the Keowee hydroelectric station mechanical, civil/structural, and electrical/instrumentation and control (I&C) components are provided in Sections 2.3, 2.4, and 2.5 of the SLRA, respectively.

1.4.3 DESCRIPTION OF STANDBY SHUTDOWN FACILITY

The standby shutdown facility is designed as a standby system for use under certain emergency conditions. It provides additional “defense in depth” protection by serving as a backup to existing safety systems. The standby shutdown facility is designed to provide an alternate means to achieve and maintain hot shutdown conditions following a fire; sabotage; turbine building flood; station blackout (SBO); and tornado events. Because the standby shutdown facility is a backup to existing safety systems, the single failure criterion is not required. Failures in the standby shutdown facility systems will not cause failures or inadvertent operations in other plant systems. The standby shutdown facility requires manual activation and can be activated if the relevant emergency systems are not available.

The standby shutdown facility is designed to achieve and maintain the reactor in a safe shutdown (SSD) condition for a period of 72 hours in accordance with criteria of its design basis events. SSD is accomplished by:

- Re-establishing and maintaining cooling of the reactor coolant pump seals to ensure natural circulation and core cooling by maintaining the primary coolant system filled to a sufficient level in the pressurizer while also maintaining sufficient secondary side cooling water, and
- Maintaining the reactor subcritical by isolating all sources of makeup water to the reactor coolant system except from the reactor coolant makeup system, which supplies water with a sufficient boron concentration.

The standby shutdown facility is primarily comprised of the structure and the auxiliary service water system; the reactor coolant makeup system; the electrical power systems; the support systems; and the diesel generator. These systems are described further in Section 2.3 of SLRA. The standby shutdown facility structure is described in Section 2.4.7.6.

1.5 APPLICATION STRUCTURE

In accordance with the requirements of 10 CFR Part 54, this SLRA provides the technical and environmental information required for renewal of the initial renewed operating licenses for an additional 20 years.

This SLRA is structured in accordance with Regulatory Guide (RG) 1.188, "Standard Format and Content for Applications to Renew Nuclear Plant Operating Licenses," and NEI 17-01, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal." In addition, Section 3.0, "Aging Management Review Results" and Appendix B, "Aging Management Programs" are structured to address the guidance provided in NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants." NUREG-2192 references NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report." NUREG-2191 was used to determine the adequacy of existing programs for purposes of managing aging and which existing programs should be augmented for SLR. The results of the aging management review (AMR), using NUREG-2191, have been documented and are illustrated in table format in Section 3.0, "Aging Management Review Results" of this application.

ONS Units 1, 2, and 3 are constructed of similar materials with similar environments. Unless otherwise noted throughout this SLRA, plant systems and structures discussed in this SLRA apply to all three units.

This SLRA and supporting environmental report are intended to provide sufficient information for the NRC to complete its technical and environmental reviews and enable the NRC to make the findings required by 10 CFR 54.29 in support of renewal of the initial renewed operating licenses.

The SLRA is organized into four sections and five appendices as follows:

Section 1.0 - Administrative Information

Section 1.0 provides the administrative information required by 10 CFR 54.17 and 10 CFR 54.19. The section describes the plant and states the purpose for this application. Included in this chapter are the names, addresses, business descriptions, organization, and management descriptions of the applicant, as well as other administrative information. Also provided is an overview of the structure of the SLRA, acronyms and general references used throughout the SLRA.

Section 2.0 - Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results

This section describes and justifies the methods used in the IPA to identify those structures and components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(2). These methods consist of: (1) scoping, which identifies the systems, structures, and components (SSCs) that are within the scope of 10 CFR 54.4(a), and (2) screening under 10 CFR 54.21(a)(1), which identifies those in-scope SSCs that perform intended functions without moving parts or a change in configuration or properties, and that are not subject to replacement based on a qualified life or specified time period. In addition, the scoping results for systems and structures are described in Section 2.0. Scoping results are presented in Section 2.2, Table 2.2-1, and Table 2.2-2. Screening results are presented in Sections 2.3, 2.4, and 2.5.

The screening results consist of lists of component types that require AMR. Descriptions of mechanical systems and structures within the scope of SLR are provided as background information. The descriptions of systems identify SLR drawings that document the in-scope mechanical components. The SLR drawings are provided in a separate submittal. For each in-scope system and structure, component types requiring an AMR are identified, associated component intended functions are identified, and the appropriate reference to the Section 3.0 table providing the AMR results is provided.

Selected structural and electrical component types, such as component supports and cables, were evaluated as commodities. Under the commodity approach, selected structural and electrical component types were evaluated based upon common environments and materials. For each of these commodities, the component types requiring AMR are presented in Sections 2.4 and 2.5.

Section 3.0 – Aging Management Review Results

10 CFR 54.21(a)(3) requires a demonstration that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB throughout the PEO. Section 3.0 presents the results of the AMRs. Section 3.0 is the link between the scoping and screening results provided in Section 2.0 and the aging management programs (AMP) described in Appendix B.

AMR results are presented in tabular form, in a format in accordance with Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (NUREG-2192). For mechanical systems, AMR results are provided in Sections 3.1, 3.2, 3.3, and 3.4 for the reactor vessel, reactor vessel internals, and reactor coolant system; engineering safety features; auxiliary systems; and steam and power conversion system, respectively. AMR results for containment, structures, and component supports are provided in Section 3.5. AMR results for electrical and I&C are provided in Section 3.6.

Section 4.0 – Time Limited Aging Analyses

TLAA, as defined by 10 CFR 54.3, are listed in this section. Section 4.0 includes each of the TLAA identified in SRP-2192 and in plant-specific analyses. This section includes a summary of the time dependent aspects of the analyses. A demonstration is provided to show that: (1) each of the analyses remains valid for the SPEO, (2) the analyses have been projected to the end of the SPEO, or (3) the effects of aging on the intended function(s) will be adequately managed for the SPEO.

Section 4.0 also confirms that no 10 CFR 50.12 exemption involving a TLAA as defined in 10 CFR 54.3 is required during the SPEO. The information in Section 4.0 fulfills the requirements in 10 CFR 54.21(c).

Appendix A – Updated Final Safety Analysis Report Supplement

As required by 10 CFR 54.21(d), the UFSAR supplement is found in Appendix A and contains a summary of activities credited for managing the effects of aging for the SPEO. In addition, summary descriptions and dispositions of TLAA evaluations and a summary of SLR commitments are provided. The SLR commitments are identified in Table A6.0-1, Subsequent License Renewal Commitments List. The information in Appendix A fulfills the requirements in 10 CFR 54.21(d).

Appendix B – Aging Management Programs

Appendix B describes the programs and activities that are credited for managing aging effects for components or structures during the SPEO based upon the AMR results provided in Section 3.0 and the TLAA results provided in Section 4.0. The information in Section 2.0, Section 3.0, and Appendix B fulfills the requirements of 10 CFR 54.21(a).

Appendix C – MRP-227-A Gap Analysis

Appendix B2.1.7 satisfies the guidance of NUREG-2192 Section 3.1.2.2.9 to provide a gap analysis of the components that are within the scope of the PWR Vessel Internals program and consistent with Interim Staff Guidance (ISG) SLR–ISG–2021–01–PWRVI, "Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors." Using an MRP-227-A based program (i.e. EPRI 1022863, Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines) as a starting point, the gap analysis is a basis for identifying and justifying potential changes to the program that will manage aging degradation effects for reactor vessel internal components during the SPEO. Since the gap analysis is provided in Appendix B2.1.7, Appendix C is not used for the ONS SLRA.

Appendix D – Technical Specification Changes

Appendix D satisfies the requirements of 10 CFR 54.22 to identify whether any technical specification changes or additions are necessary to manage the effects of aging during the SPEO. Since no technical specification changes are requested, Appendix D is not used.

Appendix E – Environmental Report—Subsequent Operating License Renewal Stage

Appendix E satisfies the requirements of 10 CFR 54.23 to provide a supplement to the Environmental Report that complies with the requirements of subpart A of 10 CFR 51.

1.6 ACRONYMS

Table 1.6-1 Acronyms

Acronym	Definition
AC	Alternating Current
ACI	American Concrete Institute
AHU	Air Handling Unit
AISC	American Institute of Steel Construction
AMP	Aging Management Program
AMR	Aging Management Review
ANSI	American National Standards Institute
ARDM	Age Related Degradation Mechanism
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
ATWS	Anticipated Transient Without Scram
AWS	American Welding Society
B&PV	Boiler & Pressure Vessel
B&W	Babcock & Wilcox

Table 1.6-1 Acronyms

Acronym	Definition
BTP	Branch Technical Position
BWC	Babcock & Wilcox Canada
BWNT	B&W Nuclear Technologies
BWOG	Babcock & Wilcox Owners Group
BWR	Boiling Water Reactor
CASS	Cast Austenitic Stainless Steel
CFR	Code of Federal Regulations
CLB	Current Licensing Basis
CMAA	Crane Manufacturers Association of America
CMTR	Certified Material Test Report
CRDM	Control Rod Drive Mechanism
CUF	Cumulative Usage Factor
CUF_{en}	Cumulative Usage Factor (environmental effects)
CVN	Charpy V-Notch
DBA	Design Basis Accident
DBD	Design Basis Document
DBE	Design Basis Event
DC	Direct Current

Table 1.6-1 Acronyms

Acronym	Definition
DNB	Departure from Nucleate Boiling
DOR	Division of Operating Reactors
DSS	Diverse Scram System
Duke Energy	Duke Energy Carolinas, LLC
EAF	Environmentally-Assisted Fatigue
EDB	Equipment Database
EFPY	Effective Full Power Years
EOCI	Electric Overhead Crane Institute
EPRI	Electric Power Research Institute
EQ	Environmental Qualification
EQML	Environmental Qualification Master List
FERC	Federal Energy Regulatory Commission
FSAR	Final Safety Analysis Report
ft-lb	Foot-Pound
GALL-SLR	Generic Aging Lessons Learned for Subsequent License Renewal
GDC	General Design Criteria
GL	Generic Letter
GLRP	Generic License Renewal Program

Table 1.6-1 Acronyms

Acronym	Definition
GSI	Generic Safety Issue
HELB	High Energy Line Break
I&C	Instrumentation and Controls
ICS	Integrated Control System
ID	Inner Diameter
IEB	Inspection and Enforcement Bulletin
ILRT	Integrated Leak Rate Test
INF	Inlet Nozzle Forging
IPA	Integrated Plant Assessment
IS	Intermediate Shell
ISG	Interim Staff Guidance
ISI	Inservice Inspection
ksi	Kilo-Pound Per Square Inch
kV	Kilovolt
LAI	Licensee Action Item
LBB	Leak Before Break
LCM	Life Cycle Management
LER	Licensee Event Report

Table 1.6-1 Acronyms

Acronym	Definition
LOCA	Loss of Coolant Accident
LR	License Renewal
LR-ISG	License Renewal Interim Staff Guidance
LRA	License Renewal Application
LS	Lower Shell
LV	Low Voltage
MeV	Megaelectron Volt
MFB	Main Feeder Bus
MIC	Microbiologically Induced Corrosion
MPa	Megapascal
MRP	Materials Reliability Program
MSLB	Main Steam Line Break
mV	Millivolt
MVA	Megavolt Amp
MW	Megawatt
NC	North Carolina
NCUC	North Carolina Utilities Commission
NEI	Nuclear Energy Institute (formerly NUMARC)

Table 1.6-1 Acronyms

Acronym	Definition
NFPA	National Fire Protection Association
NPRDS	Nuclear Plant Reliability Data System
NPS	Nominal Pipe Size
NPSH	Net Positive Suction Head
NRC	Nuclear Regulatory Commission
NSAC	Nuclear Safety Analysis Center
NSSS	Nuclear Steam Supply System
NUMARC	Nuclear Management and Resources Council (now NEI)
OD	Outer Diameter
OE	Operating Experience
ONS	Oconee Nuclear Station
OSRDC	Oconee Safety Related Designation Clarification
OSS	Oconee Station Specification
PCB	Power Circuit Breaker
PEO	Period of Extended Operation
pH	Potential of Hydrogen
ppb	parts per billion
ppm	parts per million

Table 1.6-1 Acronyms

Acronym	Definition
PSCSC	Public Service Commission of South Carolina
PTS	Pressurized Thermal Shock
PWR	Pressurized Water Reactor
PWSCC	Primary Water Stress Corrosion Cracking
QA	Quality Assurance
R_c	Rockwell C
RCSC	Research Council for Structural Connections
RG	Regulatory Guide
RIS	Regulatory Issue Summary
RT_{NDT}	Nil-Ductility Reference Temperature
RT_{PTS}	Pressurized Thermal Shock Reference Temperature
SBLOCA	Small Break Loss of Coolant Accident
SBO	Station Blackout
SC	South Carolina
SCC	Stress Corrosion Cracking
SEI	Structural Engineering Institute
SER	Safety Evaluation Report
SLR	Subsequent License Renewal

Table 1.6-1 Acronyms

Acronym	Definition
SLRA	Subsequent License Renewal Application
SOER	Significant Operating Experience Report
SPEO	Subsequent Period of Extended Operation
SSCs	Systems, Structures, and Components
SSD	Safe Shutdown
TLAA	Time-Limited Aging Analyses
U_{EN}	Usage Considering Environmental Effects
UCC	Under Cladding Cracking
UFSAR	Updated Final Safety Analysis Report
USAEC	United States Atomic Energy Commission
USAS	United States of American Standards

1.7 REFERENCES

1.7.1 10 CFR 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants

1.7.2 NUREG-2192, Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants, July 2017

1.7.3 NUREG-2191, Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report, July 2017

1.7.4 Regulatory Guide 1.188, Revision 2, Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses, April 2020.

1.7.5 NEI 95-10, Revision 6, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule," June 2005

1.7.6 NEI 17-01, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal," December 2017.

1.7.7 10 CFR 50.48, "Fire Protection."

1.7.8 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants."

1.7.9 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events."

1.7.10 10 CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light Water Cooled Nuclear Power Plants."

1.7.11 10 CFR 50.63, "Loss of All Alternating Current Power."

1.7.12 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants."

1.7.13 NUREG-0933, "Resolution of Generic Safety Issues," U.S. Nuclear Regulatory Commission, Supplement 34, December 2011.

1.7.14 ANSI/ANS-51.1-1983, "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants."

1.7.15 10 CFR 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions"

1.7.16 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities."

1.7.17 10 CFR 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants”

1.7.18 NUREG-1437, “Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, US NRC, Revision 1, 2013.

1.7.19 Oconee Nuclear Station Units 1, 2 and 3 Renewed Facility Operating License Numbers DPR-38, DPR-47 and DPR-55

1.7.20 Oconee Nuclear Station Updated Final Safety Analysis Report (UFSAR), Revision 28, December 31, 2019.

1.7.21 10 CFR 72, “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor Related Greater Than Class C Waste.”

2.0 SCOPING AND SCREENING METHODOLOGY FOR IDENTIFYING STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW AND IMPLEMENTATION RESULTS

This section describes the process for identifying structures and components subject to AMR in the ONS IPA. For the SSCs within the scope of SLR, 10 CFR 54.21(a)(1) requires the SLR applicant to identify and list those structures and components subject to AMR. Furthermore, 10 CFR 54.21(a)(2) requires that the methods used to implement the requirements of 10 CFR 54.21(a)(1) be described and justified. Section 2.0 of this application satisfies these requirements.

The IPA process is performed in two steps. Scoping refers to the process of identifying the plant SSCs that are to be included within the scope of SLR in accordance with 10 CFR 54.4. The intended functions that are the bases for including the SSCs within the scope of SLR are also identified during the scoping process. Screening refers to the process of determining structures and components that are subject to AMR in accordance with 10 CFR 54.21(a)(1) requirements. Mechanical and structures scoping is performed at the system and structure level; scoping is also performed before screening in the IPA. In contrast, electrical scoping is performed at the component level; screening is also performed before scoping. Additionally, electrical scoping initially includes all electrical components within the scope of SLR and selectively scopes out components that do not perform an intended function meeting 10 CFR 54.4. A detailed description of the Oconee scoping and screening process is provided in Section 2.1.

The scoping and screening methodology is implemented in accordance with NEI 17-01, *"Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal"* (Reference 1.7.6). The plant level scoping results identify the mechanical systems, structures, and electrical components within the scope of SLR in Section 2.2. The screening results identify components subject to AMR in the following SLRA sections:

- Section 2.3 for mechanical systems
- Section 2.4 for containments, structures, and component supports
- Section 2.5 for electrical and I&C components

2.1 SCOPING AND SCREENING METHODOLOGY

2.1.1 INTRODUCTION

This introduction provides an overview of the scoping and screening process used at ONS. Subsequent sections provide details on how the process was implemented.

For mechanical systems and structures, the initial step in the scoping process was to define the entire plant in terms of systems and structures. Each of the identified mechanical systems and structures were then evaluated against the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), and (a)(3), to determine if the mechanical system or structure is relied upon to remain functional during and following a DBE, if the mechanical system or structure failure could prevent the satisfactory accomplishment of a function described in 10 CFR 54.4(a)(1)(i), (ii), or (iii) or if the mechanical system or structure is relied on in safety analysis or plant evaluation to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (EQ) (10 CFR 50.49), pressurized thermal shock (PTS) (10 CFR 50.61), anticipated transients without scram (ATWS) (10 CFR 50.62), or station blackout (SBO) (10 CFR 50.63). The intended function(s) that are the bases for including mechanical systems and structures within the scope of SLR were also identified.

Systems that contain mechanical components such as pumps, piping, valves, are addressed as mechanical systems. A mechanical system was included within the scope of SLR if any portion of the system met the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), or (a)(3). Mechanical systems determined to be within the scope of SLR were then further evaluated to determine the system components that are required to perform or support the identified systems intended function(s). The in-scope boundaries of mechanical systems were identified and are described in Section 2.3. These boundaries are depicted on the SLR boundary drawings. Additional details on scoping evaluations and boundary drawing development are provided in Section 2.1.4.

Structures were included within the scope of SLR if any portion of a structure met the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), or (a)(3). Structures were then further evaluated to determine the structural components that are required to perform or support the identified structures intended function(s). The portions of each structure within the scope of SLR that are required to perform or support the identified structures intended function(s) were identified and are described in Section 2.4. Structures that are within the scope of SLR are shown on a SLR boundary drawing (SLR-C-001). Additional details on scoping evaluations and boundary drawing development are provided in Section 2.1.4.

After completion of scoping, the screening process was performed to evaluate the structures and mechanical components within the scope of SLR to identify the long-lived and passive structures and components subject to AMR. In addition, the passive intended functions of structures and components subject to AMR were identified. Additional details on the screening process are provided in Section 2.1.5.

Electrical scoping was not performed at the system level but rather at the component level using a bounding or spaces approach. As discussed in the Statement of Consideration to the License Renewal Rule (60FR22462), the term “systems, structures, and components” is used in 10 CFR 54.4 to allow an applicant to scope at a system or structure level or at a component level. Whether dividing the electrical portions of the plant by systems or other means, the objective is to ensure that no electrical components that perform an intended function are excluded from the review. This approach initially includes all electrical components within scope and selectively scopes out electrical components that do not perform an intended function that meets 10 CFR 54.4. Furthermore, for efficiency of review, 10 CFR 54.4(a) is applied to electrical components only after they have been screened under 10 CFR 54.21(a)(1). Additional details on electrical and I&C scoping and screening are provided in Sections 2.1.4 and 2.1.5, respectively.

Selected components, such as equipment supports, structural items, and passive electrical components, were scoped and screened as commodities. As such, they were not evaluated with the structures or as individual components but were evaluated collectively as a commodity group. Passive structural commodities are identified in Section 2.4, and passive electrical commodities are identified in Section 2.5. Commodity groups utilized are consistent with NUREG-2192, *"Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants"*, Table 2.1-6 (Reference 1.7.2).

2.1.2 INFORMATION SOURCES USED FOR SCOPING AND SCREENING

Several different CLB and design basis information sources were utilized in the scoping and screening process. The CLB for ONS is consistent with the definition provided in 10 CFR 54.3. The CLB includes applicable NRC regulations and appendices thereto; orders; license conditions; exemptions; and technical specifications. The CLB also includes plant-specific design basis information defined in 10 CFR 50.2 as documented in the most recent UFSAR as required by 10 CFR 50.71 and the commitments remaining in effect that were made in docketed licensing correspondence such as responses to NRC bulletins, generic letters (GLs), and enforcement actions, as well as commitments documented in NRC safety evaluations or licensee event reports (LERs). A brief discussion of the significant source documentation is provided below.

2.1.2.1 Updated Final Safety Analysis Report

The ONS UFSAR, which is updated regularly in accordance with the requirements of 10 CFR 50.71(e), provided significant input for system and structure descriptions and functions.

2.1.2.2 Flow Diagrams

The flow diagrams provide mechanical systems details for ONS, including Keowee and the standby shutdown facility. These drawings were utilized to determine functional requirements, equipment location, environments and materials of construction in support of scoping, screening and AMR evaluations.

2.1.2.3 Design Basis Documents

Design Basis Documents (DBDs) are available for selected ONS systems and structures. The DBDs provide detailed descriptions of the associated system and structure design basis, including system functions and design requirements. The system and structure DBDs were reviewed, when available, during the scoping review.

2.1.2.4 Equipment Database

The Equipment Database (EDB) is a database used to store and maintain a broad array of component level information. Component quality classification, seismic qualification, equipment type and association with various regulated events are examples of information contained in the EDB.

2.1.2.5 Maintenance Rule Database

The Maintenance Rule Database documents the results of Maintenance Rule scoping for ONS systems and structures. The Maintenance Rule Database provided an additional source of information to identify system and structure functions.

2.1.2.6 Environmental Qualification Documentation

The scope of the electrical equipment and components that must be environmentally qualified for use in a harsh environment at ONS is identified in a site-specific list of equipment in the EQ program pursuant to 10 CFR 50.49.

2.1.2.7 NFPA 805 Fire Protection Program

NFPA 805 Fire Protection Program incorporates both deterministic and risk-informed, performance-based methods to establish a comprehensive set of requirements. The fire protection program describes the fire protection configuration for the confinement, detection, suppression of fires, and demonstrates the capability to achieve and maintain SSD conditions in the event of a fire, in support of the fire protection program functions. The scope of the ONS fire protection program is based on 10 CFR 50.48(a) and NFPA 805 as referenced in 10 CFR 50.48(c). Fundamental elements of the NFPA 805 fire protection program are discussed in the following key documents:

- UFSAR Section 9.5.1.
- Design Basis Specification for Fire Protection.
- NRC SER for Transition to Risk-Informed, Performance Based Fire Protection Program.

2.1.2.8 Other References

Other references utilized in the scoping and screening process included:

- Application for Renewed Operating Licenses, ONS Units 1, 2 and 3 (Initial License Renewal Application (LRA)).
- NUREG-1723, Safety Evaluation Report Related to the License Renewal of ONS, Units 1, 2 and 3.
- NRC SERs, including NRC staff review of ONS licensing submittals. Some of these documents may contain licensee commitments.
- Licensing Correspondence, including relief requests, LER, and responses to NRC communications such as NRC bulletins, GLs, or enforcement actions. Some of these documents may contain licensee commitments.
- ONS Technical Specifications and Bases
- ONS Selected Licensee Commitments

- Engineering drawings, specifications and calculations. These can provide additional information about the requirements or characteristics associated with the evaluated SSCs.
- Walkdown reports documenting the configuration and material properties of plant SSCs.

2.1.3 TECHNICAL BASIS DOCUMENTS

Technical basis documents were prepared in support of the SLR project. Technical basis documents contain technical evaluations and bases for decisions or positions associated with SLR requirements. Technical basis documents are prepared, reviewed, and approved in accordance with project procedures, and are based on the source documents described in Section 2.1.2.

2.1.3.1 Subsequent License Renewal Scoping Methodology

The following sections primarily describe the ONS scoping and screening methodology for mechanical systems and structures which are scoped at system and structure level. In contrast, electrical scoping is performed at the component level using a bounding or spaces approach. All electrical components are initially scoped-in, with selected components scoped-out based on function. Furthermore, 10 CFR 54.4(a) is applied to selectively remove electrical components from scope after electrical commodity groups are screened out as active or short-lived in accordance with 10 CFR 54.21(a)(1). Additional details on electrical and instrumentation and control scoping are provided in Section 2.1.4. A technical basis document was prepared to describe the scoping and screening methodology.

One of the first steps necessary to begin the SLR scoping process is to identify a comprehensive list of mechanical plant systems and structures to be evaluated for scoping. For ONS, this list resides and is maintained in a DBD, whose purpose is to provide the complete list of systems and structures for the Oconee site, including Keowee, and to be used as a starting point to ensure that all systems and structures are evaluated against the inclusion criteria of rules such as the Maintenance Rule and LR Rule. The Oconee UFSAR, Flow Diagram Drawings, I&C Drawings, Civil Structural Drawings, Electrical Elementary Drawings, Maintenance Rule Database, first Oconee LRA, Oconee DBDs, EDB, and plant walkdowns were utilized to ensure a complete list of mechanical systems and structures were compiled for scoping.

Once the mechanical systems and structures are identified, the technical basis document assures systems and structures included in the scoping review are associated with a system, structure, or commodity group. The technical basis document grouped in-scope mechanical systems and structures into the following categories:

- Reactor vessel, internals, and reactor coolant system
- Engineered safety features
- Auxiliary systems
- Steam and power conversion system
- Containments, structures, and component supports

This grouping of the in-scope mechanical systems and structures is based on NEI 17-01, *"Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal"* and the guidance of NUREG-2191 *"Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,"* Final Report. The complete list of mechanical systems and structures evaluated for SLR is provided in Section 2.2 of this application.

The methodology used to identify mechanical systems and structures at ONS within the scope of SLR is consistent with the guidance provided by NEI 17-01. NEI 17-01 has been endorsed by the NRC in RG 1.188, Revision 2 as an acceptable method for complying with the requirements of 10 CFR Part 54.

The review to identify mechanical systems and structures that satisfy the criteria contained in 10 CFR 54.4(a)(1), (a)(2) and (a)(3) is briefly discussed in Sections 2.1.3.2, 2.1.3.3, and 2.1.3.4, respectively.

2.1.3.2 10 CFR 54.4(a)(1) Scoping Criterion

Systems and structures are included within the scope of SLR in accordance with the 10 CFR 54.4(a)(1) scoping criterion. A technical basis document was prepared to ensure complete and consistent application of this scoping criterion. As noted in NEI 17-01 and consistent with NUREG-2192, an applicant's CLB definition of safety related may not match the 10 CFR 54.4(a)(1) definition. This is the case for ONS. Oconee was designed prior to the issuance of 10 CFR Part 50 Appendix A, *"General Design Criteria for Nuclear Power Plants"*, Appendix B, *"Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants"*, and the NRC's Standard Review Plan (NUREG 0800). In the absence of regulations and standards, ONS and other early commercial nuclear power plants developed their own definitions of "safety related" using a code-based approach based on correspondence from the USAEC and available mechanical, civil, and electrical codes. For this reason, rather than simply sorting the plant systems and structures based on safety classification, all functions required for mitigating the consequences of design basis events and the systems and components relied upon to complete those functions were identified.

A summary of the methodology for identifying functions required to mitigate design basis events for ONS is provided in Section 2.1.4.1. This method was used to identify mechanical systems and structures that meet the 10 CFR 54.4(a)(1) scoping criteria. The technical basis document provides appropriate guidance to assure that SLR scoping for 10 CFR 54.4(a)(1) met the requirements of the license renewal rule and the guidance of NEI 17-01.

2.1.3.3 10 CFR 54.4(a)(2) Scoping Criterion

Non-safety related systems and structures whose failure could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1) were included within the scope of SLR in accordance with 10 CFR 54.4(a)(2) requirements. A technical basis document was prepared to ensure complete and consistent application of this scoping criterion.

Based on NRC guidance and on industry guidance contained in NEI 17-01, systems and structures meeting the scoping criterion of 10 CFR 54.4(a)(2) will fall into the following three categories:

- Non-safety related systems and structures whose functional failure prevents satisfactory accomplishment of a 10 CFR 54.4(a)(1) function.
- Non-safety related systems directly connected to and providing structural support for systems and structures that perform a 10 CFR 54.4(a)(1) function and whose failure could directly affect the 10 CFR 54.4(a)(1) function.
- Non-safety related systems with a potential for spatial interaction with systems and structures and whose failure could create a spatial interaction with a 10 CFR 54.4(a)(1) function.

The first item is addressed during the scoping process, by identifying the non-safety related systems and structures required to functionally support the accomplishment of an intended function under 10 CFR 54.4(a)(1), and then including these supporting systems and structures within the scope of SLR under 10 CFR 54.4(a)(2). These non-safety related systems and structures are identified by reviewing the ONS UFSAR and other CLB documents. The remaining two items concern non-safety related systems with potential physical (connected to and spatial) interaction with safety related systems and structures. Scoping of these systems is the subject of NEI 95-10, Revision 6, Appendix F, as referred to in NEI 17-01.

A summary of the methodology for identifying non-safety related systems and structures with a potential for physical (connected to and spatial) interaction with a 10 CFR 54.4(a)(1) function for ONS is provided in Section 2.1.4.2. This method was used to identify mechanical systems and structures that meet the 10 CFR 54.4(a)(2) scoping criteria. The technical basis document provides appropriate guidance to assure that SLR scoping met the requirements of 10 CFR 54.4(a)(2) and the guidance in NEI 17-01.

2.1.3.4 10 CFR 54.4(a)(3) Scoping Criterion

10 CFR 54.4(a)(3) requires that plant SSCs within the scope of SLR include all systems and structures relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the regulations for fire protection (10 CFR 50.48), EQ (10 CFR 50.49), PTS (10 CFR 50.61), ATWS (10 CFR 50.62), and SBO (10 CFR 50.63). The methodology for identifying functions required to demonstrate compliance with fire protection, EQ, ATWS, SBO, and PTS regulations for ONS is provided in Section 2.1.4.3.

Technical basis documents were prepared to address SLR scoping of systems and structures relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the NRCs regulations for fire protection, EQ, ATWS, SBO, and PTS. CLB and other documents were evaluated to identify the mechanical systems and structures that are relied upon to demonstrate compliance with each of these regulations. These technical basis documents are summarized below:

Fire Protection (10 CFR 50.48)

10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analysis or plant evaluations to perform a function that demonstrates compliance with the regulations for fire protection (10 CFR 50.48) be included within the scope of SLR.

ONS has transitioned to a risk-informed, performance-based fire protection program conforming to the guidance of NFPA 805. The design of the ONS fire protection program is based upon the defense-in-depth concept. Multiple levels of protection are provided so that should a fire occur, it will not prevent SSD and will minimize the risk of a radioactive release to the environment. These levels of protection include fire prevention, fire detection and mitigation, and the capability to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition should a fire occur. This protection is provided through commitments made to NFPA 805. Fire protection features and commitments are described in UFSAR Section 9.5.1, Fire Protection Design Basis Specification and the NRC SER for *Transition to Risk-Informed, Performance Based Fire Protection Program*.

The scoping process to identify systems and structures relied upon and/or specifically committed to for fire protection for ONS is consistent with and satisfies the associated criterion in 10 CFR 54.4(a)(3). The fire protection technical basis document summarizes results of a detailed review of the plant's fire protection program documents that demonstrate compliance with the requirements of 10 CFR 50.48. The technical basis document provides a list of mechanical systems and structures credited in the plant's fire protection program documents. For the listed mechanical systems and structures, the technical basis document also identifies appropriate references. The identified mechanical systems and structures are included within the scope of SLR in accordance with 10 CFR 54.4(a)(3).

Environmental Qualification (10 CFR 50.49)

10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analysis or plant evaluations to perform a function that demonstrates compliance with the regulations for EQ (10 CFR 50.49) be included within the scope of SLR.

10 CFR 50.49 defines electrical equipment important to safety that is required to be environmentally qualified to mitigate certain accidents that would result in harsh environmental conditions in the plant. NUREG-0588 provides guidance on the regulatory requirements for 10 CFR 50.49 at nuclear power plants and outlines the scope of equipment covered. This NUREG requires that all plant electrical equipment that is in a harsh environment and must function to mitigate DBEs, be qualified to operate in that environment. The equipment included in the EQ program includes both safety related and non-safety related electrical equipment required for accident mitigation, post-accident monitoring, and SSD.

The EQ program controls the maintenance of the list of EQ components. Therefore, it was used to identify components in scope for EQ per 10 CFR 54.4(a)(3).

The EQ technical basis document summarizes the results of a review of ONS EQ program documents. The EQ technical basis document provides a list of EQ components and structures included within the scope of SLR in accordance with 10 CFR 54.4(a)(3).

Pressurized Thermal Shock (10 CFR 50.61)

10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analysis or plant evaluations to perform a function that demonstrates compliance with the regulations for PTS (10 CFR 50.61) be included within the scope of SLR.

Fracture toughness requirements specified in 10 CFR 50.61 state that licensees of PWRs evaluate the reactor vessel beltline materials against specific criteria to ensure protection from brittle fracture. 10 CFR 50.61 requires that the reference temperature evaluated at the end-of-license fluence, defined as the reference temperature for PTS (RT_{PTS}), remain below the screening criterion for each of the reactor vessel beltline and beltline extended materials to allow continued operation without specific justification. PTS is a potential PWR event or transient causing vessel failure due to severe over-cooling (thermal shock) concurrent with, or followed by, significant pressure in the reactor vessel.

The CLB shows that the ONS reactor vessel has been demonstrated to meet the toughness requirements of 10 CFR 50.61 through its current 60-year end-of-license period. Eighty-year end-of-license fluence projections were prepared, and the components that are projected to meet the definition of beltline material after 80-years were identified. The PTS technical basis document summarizes the results of a review of the ONS CLB with respect to PTS. The reactor vessel is included within the scope of SLR in accordance with 10 CFR 54.4(a)(3).

Anticipated Transients Without Scram (10 CFR 50.62)

10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analysis or plant evaluations to perform a function that demonstrates compliance with the regulations for ATWS (10 CFR 50.62) be included within the scope of SLR.

ATWS is a postulated operational transient that generates an automatic scram signal, accompanied by a failure of the reactor protection system to automatically shut down the reactor. The ATWS rule (10 CFR 50.62) requires improvements in the design and operation of light-water cooled water reactors to reduce the likelihood of failure to automatically shut down the reactor following anticipated transients, and to mitigate the consequences of an ATWS event.

This requirement has been satisfied by the addition of the ATWS Mitigating System Actuating Circuitry (AMSAC) and the Diverse Scram System (DSS). AMSAC automatically initiates the emergency feedwater system and trips the reactor. The DSS serves as a non-safety related backup to the reactor protective system. AMSAC serves as a non-safety related backup protective system to the reactor protection system by preventing over-pressurization of the reactor coolant system, conservation of steam generator inventory, and insertion of the reactor control rods following an ATWS event.

Systems and components that provide input to AMSAC or respond to an output from AMSAC are part of the NRC approved design for meeting the requirements of 10 CFR 50.62, and are thus within the scope of SLR. The ATWS SLR scoping boundary includes the electrical/I&C components that actuate the interfacing mitigation systems, but does not include the specific components in the host mitigation system, such as the emergency feedwater system pumps, turbine standard, and control rod drives. Identification of SSCs required for ATWS is performed through a review of the UFSAR, DBDs, plant procedures, EDB, instrumentation drawings, and docketed correspondence. Likewise, the structures that house ATWS components provide support for components that are credited for 10 CFR 50.62 and are therefore in the scope of SLR.

The ATWS technical basis document includes a list of systems and structures associated with AMSAC. Systems and structures classified as satisfying 10 CFR 54.4(a)(3) related to ATWS are included within the scope of SLR.

Station Blackout (10 CFR 50.63)

10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analysis or plant evaluations to perform a function that demonstrates compliance with the regulations for SBO (10 CFR 50.63) be included within the scope of SLR.

10 CFR 50.63 requires that each light-water-cooled nuclear power plant be able to withstand, for a specified duration, and recover from an SBO. The objective of this requirement is to assure that nuclear power plants can withstand an SBO and maintain adequate reactor core cooling and containment integrity for the specified duration. An SBO event is a complete loss of AC electric power to the essential and nonessential switchgear buses in a nuclear power plant (i.e., loss of the offsite electric power system concurrent with generator trip and unavailability of the onsite emergency AC power sources).

SBO is the hypothetical case where all offsite power and both Keowee units are lost. Electrical power is available immediately from the battery systems and within 10 minutes from the standby shutdown facility diesel generator. The primary element of the event response is that the SBO duration is 4 hours and relies on the standby shutdown facility diesel generator as the alternate AC power source.

The standby shutdown facility is a stand-alone system that is designed to maintain the plant in a safe and stable condition following certain postulated events. The standby shutdown facility provides additional “defense in-depth” protection by serving as a backup to existing safety systems. The standby shutdown facility is credited as an alternate AC power source during an SBO.

Manual actions are necessary to start the standby shutdown facility diesel generator from the standby shutdown facility control room and to strip loads from vital power supplies to ensure Class 1E batteries have sufficient capacity for the 4-hour SBO coping duration and recovery. As documented in the NRC SER dated March 10, 1992 and the NRC Supplemental SER dated December 3, 1992, ONS is in compliance with 10 CFR 50.63 and conforms to the guidance of NUMARC Report 87-00 and RG 1.155.

Consistent with NUREG-2192 Section 2.5.2.1.1, the ONS SBO recovery path boundary is the equipment out to the first circuit breaker that connects to the offsite distribution system at transmission system level voltage. This path typically includes the circuit breakers that connect to the offsite system power transformers (startup transformers), the transformers themselves, the intervening overhead or underground circuits between circuit breaker and transformer and between the transformer and onsite electrical distribution system, and the associated control circuits and structures.

Off-site Power System

The ONS primary transmission system consists of a highly integrated 525 kV and 230 kV loop network. Each unit is provided with two physically independent circuits from the switching station. One circuit is from the 230 kV switching station through the startup transformer. The second circuit is the path from the switchyard through the main step-up transformer, the main generator bus and the unit's auxiliary transformer with the generator disconnected from the main bus.

ONS Unit 3 generates electric power at 19 kV that is fed through an isolated phase bus to the Unit 3 step-up transformer where it is stepped up to the transmission voltage of 525 kV. From the step-up transformer an overhead transmission line feeds power to the 525 kV switching station through two circuit breakers connecting the unit to the 525 kV transmission network. Three transmission lines connect to the ONS 525 kV switching station; one circuit goes east-northeast to Jocassee, one east to the Newport Station and one southeast to Georgia Power Company. In addition, a 230/525kV autotransformer connects the 525 kV switching station to the 230 kV switching station. The 525 kV buses, disconnect switches, and circuit breakers are arranged into a breaker-and-a-half configuration.

ONS Units 1 and 2 also generate electric power at 19 kV that is fed through an isolated phase bus on each unit to its own step-up transformer, where it is stepped up to the transmission voltage of 230 kV. From each step-up transformer, an overhead transmission line feeds power to the 230 kV switching station through two circuit breakers connecting each unit to the 230 kV transmission network. Eight transmission lines connect to the ONS 230 kV switching station; two circuits are installed east-northeast to North Greenville, four east-southeast to Central, and two north-northwest to Jocassee. The 230 kV buses, disconnect switches, and circuit breakers are arranged into a breaker-and-a-half configuration.

The Units 1, 2, and 3 auxiliary transformers and the Units 1, 2, and 3 startup transformers have two isolated secondary windings rated 6.9 kV and 4.16 kV each. The normal power supply to a unit's auxiliary load can be provided through the unit auxiliary transformer connected to the generator bus. If power is not available from the unit's generator through the unit's auxiliary transformer or operating preference is to use the start-up transformer, power is supplied to the unit’s auxiliary power system through its startup transformer fed from either or both of the buses in the 230 kV switching station. Power to the startup transformer can flow through the 230 kV switching station from any one of thirteen supplies. These include eight 230 kV transmission circuits, two nuclear generating units if operating, two Keowee hydroelectric units and the 525 kV switching station. Each unit's auxiliary startup transformer is sized to carry full load auxiliaries for one nuclear generating unit plus the engineered safeguards equipment of another unit. In addition, each unit's startup transformer can backup another unit's startup transformer through emergency startup buses and dual isolating disconnect switches.

Underlying the primary transmission system is an extensive 100 kV sub-transmission network integrated into the primary system by means of a 230/100 kV tie station. Power is available to the standby power buses either directly from the 100 kV Central Tie Substation or from W. S. Lee Natural Gas Plant via a 100 kV transmission line connected to transformer CT5. This single 100 kV circuit is connected to the 100 kV transmission system through the Central Substation. Central Substation is connected to W. S. Lee Natural Gas Plant through a similar 100 kV line. If an emergency occurs that would require the use of the 100 kV transmission system, this line can either be isolated from the balance of the transmission system to supply emergency power to ONS from W. S. Lee Natural Gas Plant, or emergency power can be supplied directly from the 100 kV system from the Central Tie Substation.

Restoration Path Boundaries

Each ONS unit has a startup circuit that connects the 230 kV switching station to the two 4.16 kV Main Feeder Buses (MFBs) 1 and 2 through the Startup Transformer for each unit. Each startup circuit includes 230 kV power circuit breakers (PCBs) in the 230 kV switching station. The startup transformers have two secondary windings, 6.9 kV and 4.16 kV. The 4.16 kV windings are connected to MFB 1 via breaker E1 and to MFB 2 via breaker E2. The 6.9 kV windings associated with the reactor coolant pumps are not part of the restoration path. In addition, MFB 1 and MFB 2 buses for each unit can also be energized from a 100 kV offsite circuit. Transformer CT5 is fed from 100 kV circuit breaker OCB-101. Transformer CT5 feeds Standby Bus 1 via medium voltage breaker SL1 and Standby Bus 2 via medium voltage breaker SL2. The two standby buses can be aligned to feed MFB 1 and MFB 2 of each unit via medium voltage breakers S1 and S2.

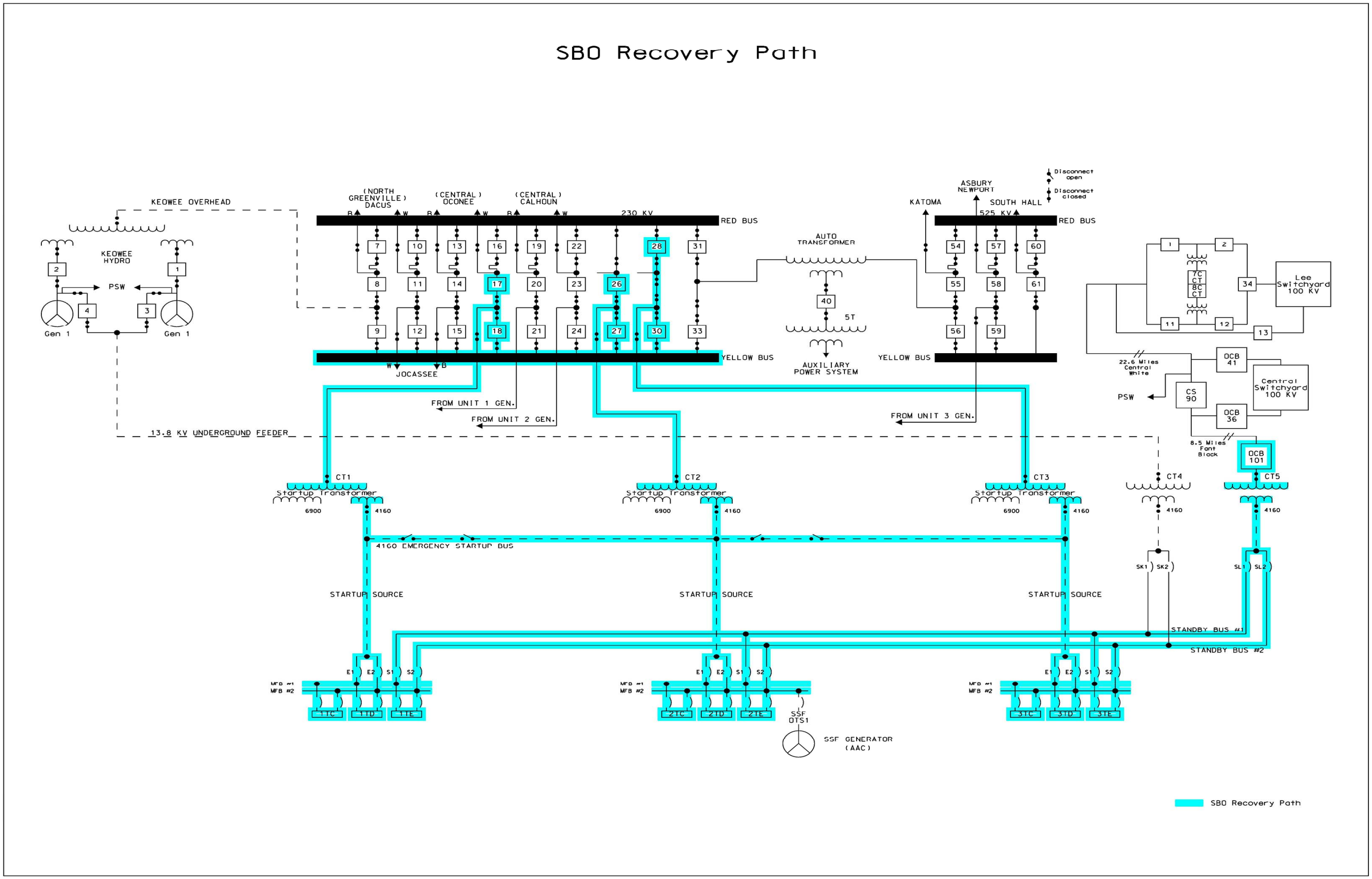
The 525 kV switching station and the switchyard auxiliary power system are not required for any of the four recovery paths. The boundaries of the four identified recovery paths are:

- PCB-17 and PCB-18
- PCB-26 and PCB-27
- PCB-28 and PCB-30
- OCB-101

See Figure 2.1.3-1 for a simplified electrical diagram of the offsite and onsite power sources, switching stations (switchyards), plant electrical distribution systems required for SBO recovery and the alternate AC source (standby shutdown facility). The 230 kV and 525 kV switchyards have two electrical buses designated as Red and Yellow. PCBs connect the two buses in a breaker-and-a-half configuration to allow removal of a PCB from service without deenergizing the circuit. The blue highlighting indicates Station Blackout recovery paths.

The SBO technical basis document summarizes the coping and recovery requirements and includes a list of systems and structures associated with SBO. Systems and structures classified as satisfying criterion 10 CFR 54.4(a)(3) related to SBO are included within the scope of SLR. The scoping methodology used is consistent with the requirements of 10 CFR 54.4 and is based on NEI 17-01 and current NRC guidance.

Figure 2.1.3-1 Simplified Electrical Diagram of the Offsite and Onsite Power Sources - SBO Recovery Paths



2.1.4 SCOPING METHODOLOGY

The scoping process is the systematic process used to identify the ONS SSCs within the scope of the LR rule. For mechanical systems and structures the scoping process was initially performed at the system and structure level, in accordance with the scoping criteria identified in 10 CFR 54.4(a). System and structure level intended functions were identified from a review of the CLB and DBDs. In-scope boundaries were established and documented in the scoping evaluations, based on the identified intended functions. The in-scope boundaries form the basis for identification of the in-scope components, which is the first step in the screening process described in Section 2.1.5. The mechanical system and structure scoping results are provided in Section 2.2.

The ONS scoping process began with the development of a comprehensive list of plant systems and structures, as described in Section 2.1.3.1. The systems and structures were grouped into one of the following categories:

- Reactor Vessel, Internals and Reactor Coolant System
- Engineered Safety Features
- Auxiliary Systems
- Steam and Power Conversion Systems
- Containments, Structures, and Component Supports

Each ONS system and structure was scoped for SLR using the criteria of 10 CFR 54.4(a). These criteria are briefly identified as follows:

- 10 CFR 54.4(a)(1) - Safety Related
- 10 CFR 54.4(a)(2) - Non-Safety Related affecting Safety Related
- 10 CFR 54.4(a)(3) - Regulated Events:
    - Fire Protection (10 CFR 50.48)
    - EQ (10 CFR 50.49)
    - PTS (10 CFR 50.61)
    - ATWS (10 CFR 50.62)
    - SBO (10 CFR 50.63)

The application of each of these criteria to the scoping of mechanical systems and structures is discussed in Sections 2.1.4.1, 2.1.4.2, and 2.1.4.3 below:

As described in Section 2.1.1, electrical and I&C components were scoped at the component level using a bounding or spaces approach. This methodology precludes the need for identifying systems for electrical and I&C components that are within the scope of SLR. The basic philosophy used in the electrical and I&C component integrated plant assessment process is that all plant electrical and I&C components are included in the review unless they are specifically scoped out per 10 CFR 54.4 or screened out per 10 CFR 54.21(a)(1). The 10 CFR 54.4(a) scoping criteria is applied only to scope out specific electrical and I&C components that do not perform an intended function. This method contrasts with the approach of applying the scoping criteria to all electrical and I&C components to determine those that are scoped in.

Also, because significant efficiencies can be gained by delaying scoping until after the larger reduction of such components which screen out per 10 CFR 54.21(a)(1), electrical and I&C components were scoped out after screening was applied to electrical commodity groups.

2.1.4.1 Safety Related – 10 CFR 54.4(a)(1)

In accordance with 10 CFR 54.4(a)(1), the SSCs within the scope of SLR include:

> *Safety related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49(b)(1)) to ensure the following functions*
>
> *(i) The integrity of the reactor coolant pressure boundary;*
> *(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or*
> *(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11 of this chapter, as applicable.*

The 10 CFR 54.4(a)(1) scoping for systems and structures was performed consistent with the guidance in NUREG-2192 and NEI 17-01. As described in Section 2.1.3.1, Oconee's definition of safety related does not match the definition in 10 CFR 54.4(a)(1) and therefore the 10 CFR 54.4(a)(1) scoping methodology relies on identifying all functions required for mitigating the consequences of DBEs and the systems and components relied upon to complete those functions. The scoping process used to identify SSCs that met the safety related criteria under 10 CFR 54.4(a)(1) included safety related QA-1 SSCs and non-QA-1 SSCs as the initial starting point.

The ONS CLB definition of DBE differs from the definition contained in 10 CFR 50.49; Oconee's set of DBEs is equal to the set of events listed and described in UFSAR Chapter 15. The set of DBEs contained in UFSAR Chapter 15 complies with the requirements of 10 CFR 54.4(a)(1) and meets the definition in 10 CFR 50.49(b)(1). The set of DBEs for which SSCs are relied upon for accident mitigation were identified in the supplemental response to Generic Letter 83-28 dated April 12, 1995 (ADAMS Accession Number ML15238A066). The NRC staff concluded that this approach to safety classification of SSCs was acceptable as described in the Safety Evaluation Report dated August 3, 1995 (ADAMS Accession Number ML16141A935). The methodology employed for SLR scoping considers an expanded set of events based on plant-specific insights consistent with the guidance in NUREG-2192, which includes conditions of normal operation, internal events, anticipated operational occurrences, DBA, external events, and natural phenomena as described in the CLB. This methodology is employed consistently to scope for current regulations that refer to the definition of "design basis events" as defined in 10 CFR 50.49, including 10 CFR 54.4 and 10 CFR 50.65 (Maintenance Rule). This scoping methodology has also been previously accepted by the NRC staff as described in NUREG-1723, "Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2 and 3".

The UFSAR Chapter 15 Accident Analyses were originally performed to address 10 CFR 100 guidelines. UFSAR Section 15.1.10 contains the following discussion of the offsite dose analysis methodology for the Chapter 15 accident events:

> Calculation of Accident Doses
>
> *The Code of Federal Regulations, Title 10, Part 100, Section 11 (Section 15.1, Ref. 34) requires a dose consequence evaluation of postulated accidents resulting in fission product releases to the environment. Two types of doses are calculated for purposes of analyzing these accidents: internal doses to the thyroid resulting from inhalation of iodines and external whole body doses resulting from submersion in noble gases and iodines.*
>
> *The dose consequences of a Maximum Hypothetical Accident, a Rod Ejection Accident, Large and Small Main Steam Line Break Accidents and Fuel Handling Accidents have been evaluated using an Alternative Source Term in accordance with the Code of Federal Regulations, Title 10, Part 50, Section 67 (Reference 39). For these evaluations, a total effective dose equivalent (TEDE) dose is calculated. Control room doses are also reported for these accidents.*

Using the complete list of mechanical systems and structures, functions that are required during and following DBEs as described in the plant's CLB were identified. For mechanical systems, the DBDs identify the system level event mitigation functions and the unique events for which the event mitigation function is required. Additional sources, primarily the UFSAR and Maintenance Rule database, were utilized in this functional review. Structures that house systems that meet the (a)(1) scoping criteria also meet the (a)(1) scoping criteria, as the structure provides a support function.

The ONS methodology for scoping identifies the SSCs relied upon to remain functional during and following DBEs and therefore meets the 10 CFR 54.4(a)(1) criterion. Scoping of mechanical systems and structures is performed at a system or structure level. Electrical and I&C systems that meet the 10 CFR 54.4(a)(1) scoping criteria (and likewise for the (a)(2) and (a)(3) criteria) are not identified since the approach is to perform electrical scoping at the component level. The scoping approach is consistent with guidance contained in NEI 17-01 and NUREG-2192. The ONS methodology for scoping under the 10 CFR 54.4(a)(1) criterion meets the requirements of 10 CFR Part 54.

2.1.4.2 Non-Safety Related Affecting Safety Related – 10 CFR 54.4(a)(2)

In accordance with 10 CFR 54.4(a)(2), the SSCs within the scope of SLR include:

- Non-safety related SSCs whose failure could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1)(i), (ii), or (iii).

This scoping criterion requires an assessment of non-safety related SSCs with respect to the following categories:

- Non-safety related SSCs that perform or provide support for 10 CFR 54.4(a)(1) functions
- Non-safety related SSCs that are connected to and provide structural support for safety related SSCs
- Non-safety related SSCs that have the potential for spatial interactions with safety related SSCs

Each of these categories are discussed below:

<u>Non-safety related SSCs that perform or provide support for 10 CFR 54.4(a)(1) functions</u>

This category addresses non-safety related SSCs that are required to function in support of a safety related SSC intended function. The functional requirement distinguishes this category from the other categories, where the non-safety related SSCs are required only to maintain adequate integrity to preclude structural failure or spatial interactions. The ONS UFSAR, CLB and DBDs were reviewed to identify non-safety related mechanical systems required to support satisfactory accomplishment of a safety related function. Non-safety related mechanical systems, or non-safety related portions of safety related systems credited in CLB documents to support a safety related function have been included within the scope of SLR for 10 CFR 54.4(a)(2) and are described in Section 2.3.

<u>Non-safety related SSCs that are connected to and provide structural support for safety related SSCs</u>

The guidance of NEI 95-10, Appendix F (as referenced in NEI 17-01) was used to identify the endpoints of non-safety related piping components that are directly attached to, and provide support for safety related piping components. The attached non-safety related piping components must be included within scope up to and including the first seismic or equivalent anchor. NEI 95-10, Appendix F lists the following configurations that correspond to this requirement:

1. A seismic anchor is defined as a device or structure that ensures that forces and moments are restrained in three orthogonal directions.

2. An equivalent anchor may be defined in the CLB and can be credited for the 10 CFR 54.4(a)(2) evaluation.

3. An equivalent anchor may also consist of a large piece of plant equipment (e.g., a heat exchanger) or a series of supports that have been evaluated as a part of a plant-specific piping design analysis to ensure that forces and moments are restrained in three orthogonal directions.

4. In cases where an equivalent anchor is not clearly described within the existing CLB information or original design basis, a combination of restraints or supports such that the non-safety related piping and associated structures and components attached to the safety related piping is included in scope up to an endpoint that encompasses at least two supports in each of three orthogonal directions.

An alternative to specifically identifying a seismic anchor or equivalent anchor is to include enough of the non-safety related piping run to ensure that these anchors are included and thereby ensure the piping and anchor intended functions are maintained. The following methods provide assurance that the included piping encompasses the non-safety related piping included in the design basis seismic analysis and is consistent with the CLB:

- A base-mounted component (e.g., pump, heat exchanger, tank, etc.) that is a rugged component and is designed not to impose loads on connecting piping. The SLR scope should include the base-mounted component as it has a support function for the safety related piping.
- A flexible connection is considered a pipe stress analysis model end point where the flexible connection decouples the piping systems (i.e., does not support loads or transfer loads across it to connecting piping).
- A free end of non-safety related piping.
- For non-safety related piping runs that are connected at both ends to safety related piping include the entire run of non-safety related piping.
- A point where the buried piping exits the ground. The buried portion of the piping should be included in the scope of SLR.
- A smaller branch line where the moment of inertia ratio of the larger piping to the smaller piping is equal to or greater than the acceptable ratio defined by the CLB (for ONS, section modulus ratio greater than 10 is used), because significantly smaller piping does not impose loads on larger piping and does not support larger piping.

These scoping boundaries are determined from review of the physical installation details, design drawings, plant specific piping analyses, seismic analysis calculations, or were identified through plant walkdowns.

Failure in non-safety related piping beyond the above anchor locations would not impact structural support for the safety related piping. Symbols identifying the anchor locations and the CLB seismic analysis boundaries (or support boundaries) that define the structural support boundary for safety related piping systems are shown on the SLR boundary drawings. When the connected non-safety related piping system contains water, steam, or oil, then the in-scope boundary may extend beyond the locations described above due to potential for spatial interaction with safety related SSCs.

Non-safety related SSCs that have the potential for spatial interactions with safety related SSCs

Non-safety related systems that are not connected to safety related piping or components, or are outside the structural support boundary for the attached safety related piping system, and have a spatial relationship such that their failure could adversely impact the performance of a safety related SSC intended function, must be included within the scope of SLR in accordance with 10 CFR 54.4(a)(2) requirements. As described in NEI 95-10, Appendix F, there are two options when performing this scoping evaluation: a mitigative option and a preventive option.

The mitigative option involves crediting plant mitigative features to protect safety related SSCs from failures of non-safety related SSCs. Examples of plant mitigative features include pipe whip restraints, jet impingement shields, spray and drip shields, seismic supports, flood barriers, and physical barriers (e.g., floors, interior walls, doors, dampers). This option requires a demonstration that the mitigating features are adequate to protect safety related SSCs from failures of non-safety related SSCs regardless of the failure location. If this level of protection can be demonstrated, then only the mitigative features need be included within the scope of SLR. The preventive option involves identifying the non-safety related SSCs that have a spatial relationship such that failure could adversely impact the performance of a safety related SSC intended function, and including the identified non-safety related SSCs within the scope of SLR without consideration of plant mitigative features.

Oconee applied a combination of the preventive and mitigative option for 10 CFR 54.4(a)(2) scoping. The preventive option as implemented at Oconee is based upon a “spaces” approach for determining potential for spatial interactions with safety related SSCs. The boundaries for the “spaces” are entire structures, or in limited cases a room within a structure that acts as physical barriers and separates safety related targets from non-safety related hazards. Mitigative features(e.g., pipe whip restraints, jet impingement shields, spray and drip shields, seismic supports, flood barriers, and physical barriers) were included for 10 CFR 54.4(a)(2) scoping and are addressed as structural components. Mitigative features in the scope of SLR included those credited in the plant’s CLB for protecting essential equipment or physical barriers relied upon to exclude non-safety related components from 10 CFR 54.4(a)(2) scoping under the preventive option.

Non-safety related piping and components that contain water, oil, or steam are not excluded from scope unless it can be demonstrated that they are not in proximity to safety related SSCs. This is demonstrated by confirming that there are no safety related SSCs located within the same space (e.g., structure or room) as the non-safety related piping or component containing water, oil, or steam. This demonstration is based on confirming that there are adequate physical barriers (e.g., structural boundaries) separating the non-safety related piping or component from safety related SSCs, thereby preventing the potential spatial interaction. The structural barrier components are included in scope. No credit is taken for separation by distance alone without a physical barrier capable of preventing the spatial interaction. The structures of concern for potential spatial interaction were identified based on a review of the CLB to determine which structures contained active or passive safety related SSCs.

Non-safety related piping and components that contain water, oil, or steam, and are located inside structures that contain safety related SSCs are included within the scope of SLR for potential spatial interaction in accordance with the requirements of criterion 10 CFR 54.4(a)(2), as recommended by NEI 95-10, Appendix F. High energy lines located within structures that contain safety related equipment are included within the scope of SLR, in accordance with 10 CFR 54.4(a)(1) or (a)(2), depending on their safety classification. Safety related high-energy lines are in scope in accordance with 10 CFR 54.4(a)(1), and non-safety related high-energy lines are in scope in accordance with 10 CFR 54.4(a)(2).

Potential spatial interaction due to leakage or spray is assumed regardless of the system’s pressure. Supports for non-safety related SSCs within structures containing safety related SSCs are included in scope.

Air and gas systems (non-liquid) are not a hazard to other plant equipment, and do not have potential for spatial interactions with safety related SSCs. SSCs containing air or gas cannot adversely affect safety related SSCs due to leakage or spray, since gas systems contain no liquids that could spray or leak onto safety related systems to cause shorts or other malfunctions. Over 10 years of ONS OE was reviewed and confirmed that there have been no failures due to aging in systems containing air or gas that have adversely impacted the accomplishment of a safety related function. The non-safety related systems containing air or gas are not included within the scope of SLR for spatial interaction, except in cases where accumulation of condensation drainage can occur. The supports are included in scope to prevent the non-safety related piping from falling and potentially impacting safety related SSCs.

Scoping of abandoned mechanical components

A limited number of mechanical fluid components at ONS have been abandoned in place. Abandoned components within structures containing safety related components were excluded from scope when the following conditions were met:

1. The abandoned components do not provide structural or seismic support to attached safety related piping, and

2. The abandoned components are physically separated from sources of water through blanks, blind flanges or pipe caps. Closed valves are not credited for isolation of fluid from abandoned components, and

3. The abandoned components are empty and drained of all fluid. This was verified by establishing configuration (such as the piping being open-ended at the low point), by review of documents that abandoned the equipment, or by inspection by methods capable of confirming the absence of fluid.

If these conditions are not met, the abandoned systems or portions thereof are included within the scope of SLR. Abandoned equipment is not relied on to perform any function delineated in 10 CFR 54.4(a)(1) or (a)(3) as it is no longer in operation.

2.1.4.3 Regulated Events – 10 CFR 54.4(a)(3)

In accordance with 10 CFR 54.4(a)(3), the SSCs within the scope of SLR include:

> *All systems, structures and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).*

For each of the five regulations, a technical basis document was prepared to provide input into the scoping process. Each of the regulated event technical basis documents (described in Section 2.1.3) identifies the systems and structures that are relied upon to demonstrate compliance with the applicable regulation. The technical basis documents also identify the source documentation used to determine the scope of components within the system that are credited in demonstrating compliance with each of the applicable regulated events. Guidance provided by the technical basis documents was incorporated into the system and structure scoping evaluations to determine the SSCs credited for each of the regulated events. SSCs credited in the regulated events have been classified as satisfying criteria of 10 CFR 54.4(a)(3) and have been included within the scope of SLR.

2.1.4.4 System and Structure Intended Functions

For the mechanical systems and structures within the scope of SLR, the intended functions that are the bases for including them within the scope of SLR are identified and documented in the scoping evaluation. The system or structure intended functions are based on the applicable CLB reference documents. The component level intended functions are the passive component functions that are necessary to support the system or structure intended function(s). The component and structure intended functions are further described in Section 2.1.5.2.

2.1.4.5 Scoping Boundary Determination

SLR boundary drawings were developed to convey the mechanical systems and major components that were determined to be within the scope of SLR. This was accomplished by review of various information sources and the scoping technical basis documents to determine intended functions and the flow paths necessary to fulfill intended functions. The initial step in the process was to identify the systems and structures that met the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), and (a)(3). The intended function(s) that are the bases for including systems and structures within the scope of SLR were identified.

Boundary drawings were prepared for each mechanical system within the scope of SLR. The system flow paths required to perform or support the system intended function(s) were mapped as flow paths on the system flow diagrams. The flow paths were mapped using a two-color highlighting convention. Systems and components that met the (a)(1), the functional part of the (a)(2), or the (a)(3) scoping criterion are highlighted blue while those that met the physical (connected to and spatial) interaction part of the (a)(2) scoping criteria are highlighted magenta.

A site layout drawing was used as the starting point for identifying the structures within the scope of SLR. Structures were identified as in-scope based on any portion of the structure performing an intended function. The in-scope structures were highlighted on the layout drawing, creating the structural SLR boundary drawing.

No boundary drawings were prepared for electrical or I&C systems. The approach for electrical and I&C was to initially include all the electrical components in scope and scope out per 10 CFR 54.4 or screen out per 10 CFR 54.21(a). Evaluations were then performed on a commodity level.

A technical basis document was prepared to provide appropriate guidance, describe the methodology for preparing boundary drawings and contain the boundary drawings.

2.1.5 SCREENING METHODOLOGY

Once the SSCs within the scope of SLR have been determined, the next step is to determine which structures and components are subject to an AMR.

2.1.5.1 Identifications of Structures and Components Subject to Aging Management Review

SSCs that were determined to be within the scope of SLR were then screened to determine which structures and components are subject to an AMR.

The requirement to identify structures and components subject to an AMR is specified in 10 CFR 54.21(a)(1), which states:

> *(a) An integrated plant assessment (IPA). The IPA must*
>
> *1. For those system, structures, and components within the scope of this part, as delineated in §54.4, identify and list those structures and components subject to an aging management review. Structures and components subject to an aging management review shall encompass those structures and components*
>
> *i. That perform an intended function, as described in §54.4, without moving parts or without a change in configuration or properties. These structures and components include, but are not limited to, the reactor vessel, the reactor coolant system pressure boundary, steam generators, the pressurizer, piping, pump casings, valve bodies, the core shroud, component supports, pressure retaining boundaries, heat exchangers, ventilation ducts, the containment, the containment liner, electrical and mechanical penetrations, equipment hatches, seismic Category I structures, electrical cables and connections, cable trays, and electrical cabinets, excluding, but not limited to, pumps (except casing), valves (except body), motors, diesel generators, air compressors, snubbers, the control rod drive, ventilation dampers, pressure transmitters, pressure indicators, water level indicators, switchgears, cooling fans, transistors, batteries, breakers, relays, switches, power inverters, circuit boards, battery chargers, and power supplies; and*
>
> *ii. That are not subject to replacement based on a qualified life or specified time period.*

Structures and components that perform an intended function without moving parts or without a change in configuration or properties are defined as passive for SLR. Passive structures and components that are not subject to replacement based on a qualified life or specified time period are defined as long-lived for SLR. Screening is the process used to identify the passive, long-lived structures and components within the scope of SLR. These structures and components are subject to AMR.

NUREG-2192 Table 2.1-6 was used as the basis for the identification of passive structures and components, as recommended by NEI 17-01, Section 1.1. Most passive structures and components are long-lived. The IPA technical basis documents identify the cases where a passive component is determined not to be long-lived.

The ONS structures and components subject to AMR have been identified in accordance with the requirements of 10 CFR 54.21(a)(1) described above. The process implemented to meet these requirements for mechanical systems, structures, and electrical commodities is described as follows:

Mechanical Systems

The mechanical system screening process began with the results from the scoping process. For in-scope mechanical systems, the written descriptions and marked up system flow diagrams identify the in-scope system boundary of passive components for SLR. The marked-up system flow diagrams are the SLR boundary drawings. These system boundary drawings were reviewed to identify the passive, long-lived components, and the identified components were evaluated in the IPA technical basis documents.

The screening results for mechanical systems either identify: 1) the component name for major process equipment (e.g., air handling units, fans, heat exchangers, pumps, tanks, etc.), or 2) the component types (as depicted on the boundary drawings) for in-line piping components (e.g. flow elements, sight glasses, orifices, strainers, traps, and valves, etc.) that are subject to AMR. Additionally, the component type “Piping and Piping Components” has been developed to represent piping and in-line piping components within the system that are susceptible to aging effects of wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. In contrast to other aging mechanisms, these aging mechanisms are not applicable to all components or component types of a given material and environment combination. Susceptibility to these mechanisms are only manifested when certain conditions (e.g. geometry, velocity, temperature, pressure, two-phase flow, etc.) are present. Susceptibility to these aging effects is determined through analyses or plant operating experience.

Component listings from the EDB were also reviewed to confirm that all system components were considered during the process. In cases where the flow diagrams did not provide sufficient detail, such as for some large vendor supplied components (e.g., compressors, emergency diesel generators), the associated mechanical piping layout drawings, component drawings or vendor manuals were also reviewed. Plant walkdowns were performed when required for confirmation. Short-lived components were excluded from AMR. The bases for their exclusion were documented in the IPA technical basis documents.

A complex assembly is a predominantly active assembly where the performance of its components is closely linked to that of the intended function of the entire assembly, such that testing and monitoring of the assembly is sufficient to identify degradation of these components. Examples of complex assemblies include diesel generators and chiller units. Complex assemblies are considered active and can be excluded from the requirements of AMR. However, to the extent that complex assemblies include piping or components that interface with external equipment, or components that cannot be adequately tested or monitored as part of the complex assembly, those components are identified and subject to AMR. This follows the screening methodology for complex assemblies as described in Table 2.1-2 of NUREG-2192.

Note that the majority of safety related air operated valves normally fail to their safety position. For these components, the supply of compressed air does not support the system intended function. Safety related components such as solenoid valves whose only function is to vent the air from these valve operators are within-scope, but the function is performed by active internal components, and the passive pressure boundary of the valve body or piping components does not contribute to the safety related function. These components are not subject to AMR. However, a limited number of safety related air-operated valves do not fail to their safety position. For these components, the compressed air supply to the air-operated valves support the system intended function and are identified on the boundary drawings as being within the scope of SLR. The passive and long-lived components in the compressed air supply system to these components are subject to AMR.

Mechanical components are screened with the system in which they were scoped. For heat exchangers, the entire heat exchanger is evaluated within the system in which it is identified by the tag number on the flow diagrams.

Structures

Structures and structural components typically perform their functions without moving parts and without a change in configuration or properties. When a structure or structural component was determined to be within the scope of SLR by the scoping process described in Section 2.1.4, the structure screening methodology classified the component as active or passive. Active components do not require aging management. This is consistent with guidance found in NUREG-2192 Table 2.1-6, as referenced by NEI 17-01. During the structure screening process, the intended function(s) of passive structural components were documented. In the structure screening process, an evaluation was made to determine whether in-scope structural components were subject to replacement based on a qualified life or specified time period. If an in-scope structural component was determined to be subject to replacement based on a qualified life or specified time period, the component was identified as short-lived and was excluded from an AMR. In such a case, the basis for determining that the structural component was short-lived was documented.

Electrical Commodities

Screening of electrical and I&C components used a bounding approach as described in NEI 17-01. Electrical and I&C components were assigned to commodity groups based on the listing in NUREG-2192, Table 2.1-6. Commodities subject to an AMR were identified by applying 10 CFR 54.21(a)(1) to identify those commodities that perform their function without moving parts or a change in configuration (passive components). This method provides the most efficient means for determining the electrical commodities subject to an AMR since many electrical and I&C components are active. Passive commodity groups were reviewed, and any that did not perform an intended function were determined to not require an AMR. The remaining passive commodity groups were screened consistent with 10 CFR 54.21(a)(1)(ii) to exclude those commodities that are subject to replacement based on a qualified life or specific time period from the requirements of an AMR. After screening of electrical commodities was performed, 10 CFR 54.4(a) was applied to selected electrical components to remove from scope based on function. The remaining passive commodities were determined to be subject to AMR. The electrical commodities that require an AMR are identified in Section 2.5

2.1.5.2 Intended Function Definitions

The intended functions that the components and structures must fulfill are those functions that are the bases for including them within the scope of SLR. A component intended function is defined as a passive component function that must be performed in order for the system or structure to be able to perform the system or structure intended function(s). For example, pressure boundary failure of a component would cause loss of inventory from the system, and the system would subsequently be unable to perform its intended function(s). Structures and components may have multiple intended functions. Oconee has considered multiple intended functions where applicable, consistent with the staff guidance provided in Table 2.1-3 of NUREG-2192.

Table 2.1.5-1 provides expanded definitions of structure and component passive intended functions identified in this application.

Table 2.1.5-1 Passive Structure and Component Intended Function Definitions

Intended Function	Definition
Core Support	Provide structural support to maintain core configuration and flow distribution.
Direct Flow	Provide spray shield or curbs for directing flow
Electrical Continuity	Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current, or signals
Electrical Insulation	Insulate and support an electrical conductor
Filtration	Provide filtration
Fire Barrier	Provide rated fire barrier to confine or retard a fire from spreading to or from adjacent areas of the plant
Flood Barrier	Provide flood protection barrier (internal/external flooding event)
Flow Distribution	Distribute or divide flow

Table 2.1.5-1 Passive Structure and Component Intended Function Definitions

Intended Function	Definition
Flow Restriction	Flow restriction/throttling
Gaseous Release Path	Provide path for release of filtered and unfiltered gaseous discharge
Heat Sink	Provide heat sink during SBO or DBE
Heat Transfer	Provide heat transfer
Maintain Coating Integrity	Maintain coating integrity to prevent clogging emergency core cooling systems
Missile Barrier	Provide missile barrier (internally or externally generated)
Pressure Boundary	Provide pressure-retaining boundary so that sufficient flow at adequate pressure is delivered, or provide fission product barrier for containment pressure boundary, or provide containment isolation for fission product retention
Shelter, Protection	Provide shelter/protection to safety related components (including radiation shielding for civil structures)
Spray Pattern	Provide adequate flow in a properly distributed spray pattern
Structural Integrity	Maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety related SSCs (i.e. leakage boundary) or provides structural support to attached safety related piping and components. This function applies to non-safety related components
Structural Pressure Boundary	Provide pressure boundary or essentially leak tight barrier to protect public health and safety in the event of any postulated DBEs

Table 2.1.5-1 Passive Structure and Component Intended Function Definitions

Intended Function	Definition
Structural Support	Provide structural and/or functional support to safety related and/or non-safety related components
Thermal Resistance	Provide insulation/thermal resistance

The component's intended function(s) are provided in the tables of Sections 2.3, 2.4, and 2.5.

2.1.5.3 Stored Equipment

Stored equipment is evaluated with the applicable system. Some non-plant equipment is staged for use by the Fire Brigade, such as smoke ejectors and ventilation trunks, but is not relied upon for fire protection or SSD. Other fire-fighting equipment, such as extinguishers, air packs and fire hoses are addressed as consumables.

ONS stores several components for mitigation of events that perform functions described in 10 CFR 54.4(a):

- The protected service water portable pump is utilized to refill the Unit 2 condenser circulating water intake piping during events requiring the protected service water system. The equipment, consisting of the portable pump and associated fire hose, cable reel and connectors, are stored in a warehouse.
- The standby shutdown facility submersible pump is utilized to refill the Unit 2 condenser circulating water intake piping during events requiring the standby shutdown facility system. The equipment, consisting of a submersible pump, fire hose, piping and fitting, and cables, are stored in the standby shutdown facility.
- Temporary alternate chilled water equipment is utilized to provide cooling to auxiliary building air handling units in the east and west cable rooms during a fire event. The equipment, consisting of hoses, fittings, valves, and flow meter, are stored in the Unit 2 cable room.
- The low pressure service water system utilizes a portable pumping system to provide reactor building cooling during events requiring extended operation of the protected service water system. The equipment consists of hoses, piping skid, and a trailer mounted diesel driven pump.

These components are within the scope of SLR. The flow meter and trailer mounted diesel driven pump are considered active and is not subject to AMR. The other equipment is subject to AMR. Mechanical stored equipment is evaluated with the associated mechanical systems. The cables and connectors are evaluated with electrical equipment.

2.1.5.4 Consumables

The evaluation process for consumables is consistent with the guidance provided in NUREG-2192, Table 2.1-3. Consumables have been divided into the following four (4) groups for the purpose of SLR: (a) packing, gaskets, component seals, and O-rings; (b) structural sealants; (c) oil, grease, and components filters; and (d) system filters, fire extinguishers, fire hoses, and air packs.

- Group (a) subcomponents (packing, gaskets, component seals, and O-rings): Managing loss of leak tightness due to degraded packing, gaskets, component seals, and O-rings for the pressure boundary and leakage boundary intended functions is not required. It is unlikely that leakage from packing, gaskets, component seals, and O-rings would result in failure of the system to deliver sufficient flow at adequate pressure. In regard to leakage, ONS routinely conducts tours of the operating spaces. When leakage is detected, these issues are entered into the corrective action program. The leakage is corrected by replacing the packing, gaskets, component seals, and O-rings as consumables. Therefore, these subcomponents are not subject to AMR.
- Group (b) structural sealants: AMR was required for structural sealants in structures within the scope of SLR.
- Group (c) subcomponents (oil, grease, and component filters): These subcomponents are short-lived and are periodically replaced. Various plant procedures are used in the replacement of oil, grease, and filters in components that are in-scope for SLR. Therefore, these subcomponents are not subject to an AMR.
- Group (d) consumables (system filters, fire extinguishers, fire hoses, and air packs): System filters are replaced in accordance with plant procedures based on vendor manufacturers' requirements and system testing. Fire extinguishers, self-contained breathing air packs, and fire hoses are within the scope of SLR, but are not subject to aging management because they are replaced based on condition. These components are periodically inspected in accordance with NFPA 10 for portable fire extinguishers, 29 CFR 1910 Subpart L for self-contained breathing air packs, and NFPA 1962 for fire hoses. These standards require replacement of equipment based on their condition or performance during testing and inspection. These components are subject to replacements implemented by controlled procedures, and are therefore not long-lived and not subject to AMR.

2.1.6 INTERIM STAFF GUIDANCE DISCUSSION

As discussed in NEI 17-01, the NRC has encouraged applicants to address Subsequent License Renewal Interim Staff Guidance (SLR-ISG) documents in the SLRA. These ISGs update NUREG–2191, *“Generic Aging Lessons Learned for Subsequent License Renewal (GALL–SLR) Report,”* and NUREG–2192, *“Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants.”* The staff has reviewed the first three SLRAs that were based on the previously noted guidance documents. During these reviews, the staff and applicants identified improvements to the guidance that would assist in preparing and reviewing future SLRAs more effectively and efficiently. These ISGs provide interim updates to NUREG–2191 and NUREG–2192 to implement these improvements. These ISGs are not intended for standalone use. They provide revisions to NUREG–2191 and NUREG–2192 sections and tables that supersede the content in the NUREGs and are intended to be used within the context of the NUREGs. As of March 31, 2021, the following four SLR-ISGs have been issued:

1. SLR–ISG–2021–01–PWRVI, *"Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors"*, (Effective on February 18, 2021).

2. SLR–ISG–2021–02–MECHANICAL, *"Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance"*, (Effective on March 29, 2021).

3. SLR–ISG–2021–03–STRUCTURES, *"Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance"*, (Effective on March 29, 2021).

4. SLR–ISG–2021–04–ELECTRICAL, *"Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance"*, (Effective on March 29, 2021).

The revisions captured in these ISGs include:

- Updates to recommended GALL-SLR aging management programs;
- Changes to aging management review items in NUREG–2191 tables and corresponding summary tables in NUREG–2192;
- New aging management review items in NUREG–2191 tables and corresponding summary tables in NUREG–2192;
- Changes to NUREG–2192 "further evaluation" guidance sections;
- Updates to references listed in affected NUREG–2191 sections; and
- Editorial corrections to relevant sections.

The information provided in these ISGs has been incorporated into the SLRA where applicable. The following sub-sections provide summaries of the revisions to the GALL-SLR Report and SRP-SLR.

2.1.6.1 SLR–ISG–2021–01–PWRVI, *"Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors"*

The guidance document changes issued in SLR–ISG–2021–01–PWRVI are based on the updated inspection and evaluation guidelines in Electric Power Research Institute (EPRI) Materials Reliability Program Topical Report No. 3002017168, *"Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227, Revision 1-A),"* issued June 2020, which the NRC staff found acceptable for referencing in licensing applications in its safety evaluation dated April 25, 2019, and approved for use in the staff's letters to the EPRI Materials Reliability Program dated February 19, 2020, and July 7, 2020. The NRC issued SLR–ISG–2021–01–PWRVI to accomplish the following five objectives:

1. GALL-SLR Report and SRP-SLR guidance changes: Update the staff's guidance for PWR reactor vessel internal components in the GALL-SLR Report and SRP-SLR to account for changes in inspection and evaluation criteria for PWR reactor vessel internal

components made in MRP-227, Revision 1-A, and in other relevant industry documents (e.g., EPRI Materials Reliability Program expert panel reports for 80-year reactor vessel internals component assessments or in relevant industry interim guidance documents or alert letters).

2. Clarification on the use of MRP-227, Revision 1-A: Clarify whether incorporation and adoption of MRP-227, Revision 1-A, may be used as the starting basis for the PWR vessel internals AMP (B2.1.7) and whether reference to the criteria in MRP-227, Revision 1-A, in a PWR applicant's SLRA will need to be subject to the performance of an reactor vessel internal component-specific gap analysis.

3. Reduction of unnecessary burden for PWR SLRAs: Provide additional clarifications on PWR vessel internals AMP (B2.1.7) programmatic change bases that are considered to be administrative and that will no longer need to be within the scope of AMP-identified exceptions or enhancements.

4. Resolution of applicant/licensee action items: Resolve whether the staff's applicant/ licensee action items in its safety evaluation for the inspection and evaluation guidelines in EPRI Topical Report 1022863, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)," dated December 16, 2011, and applicant/licensee action item Number 1 in the staff's safety evaluation for the inspection and evaluation guidelines in MRP-227, Revision 1-A, dated April 25, 2019, need to be addressed in an initial LRA or an SLRA.

5. Closure of Regulatory Information Summary (RIS) 2011-07: Provide the staff's basis for closing previous guidance matters raised in RIS 2011-07, "License Renewal Submittal Information for Pressurized Water Reactor Internals Aging Management," dated July 21, 2011.

2.1.6.2 SLR–ISG–2021–02–MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance"

This SLR-ISG includes revisions to the following GALL-SLR Report and SRP-SLR sections:

- Aging Management Program (AMP) X.M2, *"Neutron Fluence Monitoring"*
- AMP XI.M2, *"Water Chemistry"*
- AMP XI.M12, *"Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"*
- AMP XI.M21A, *"Closed Treated Water System"*
- Aging Management Review Line Items Associated with AMP XI.M26, *"Fire Protection"*
- SRP-SLR Table 3.3-1 and GALL-SLR Table VII H2 to Address Reduction of Heat Transfer for Heat Exchanger Tubes in a Fuel Oil Environment
- SRP-SLR Table 3.3-1 and GALL-SLR Table VII H2 to Address Loss of Material in Nickel Alloy Strainer Components in Fuel Oil
- AMP XI.M42, *"Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"*

2.1.6.3 SLR–ISG–2021–03–STRUCTURES, *"Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance"*

This SLR-ISG includes revisions to the following GALL-SLR Report and SRP-SLR sections:

- SRP-SLR Section 3.5.2.2.1.5, *"Cumulative Fatigue Damage,"* SRP-SLR Section 3.5.3.2.1.5, *"Cumulative Fatigue Damage,"* SRP-SLR Section 3.5.6, "References," GALL-SLR Report Chapter II, and aging management review (AMR) items associated with cracking due to cyclic loading in SRP-SLR Table 3.5-1, *"Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report"*
- GALL-SLR Report Aging Management Program (AMP) XI.S8, *"Protective Coating Monitoring and Maintenance"*
- GALL-SLR Report Chapter II to Allow Plant-Specific Aging Management Options
- GALL-SLR Report Chapter III to Allow Plant-Specific Aging Management Options
- SRP-SLR Section 3.5 and Table 3.5-1 to Allow Plant-Specific Aging Management Options and Provide Option to Perform Further Evaluation Related to Fatigue Waiver Analyses

2.1.6.4 SLR–ISG–2021–04–ELECTRICAL, *"Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance"*

This SLR-ISG includes revisions to the following GALL-SLR Report and SRP-SLR sections:

- Aging Management Program (AMP) XI.E3A, *"Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"*
- AMP XI.E3B, *"Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"*
- AMP XI.E3C, *"Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"*
- AMP XI.E7, *"High-Voltage Insulators"*

2.1.7 GENERIC SAFETY ISSUES

Consistent with guidance provided in NEI 17-01 and Appendix A.3 of NUREG-2192, *"Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants,"* a review of NRC Generic Safety Issues (GSIs) is performed as part of the SLR process to satisfy 10 CFR 54.29 requirements. The guidance states that GSIs involving issues related to SLR AMR and/or TLAA should be addressed in SLR applications. Based on Nuclear Energy Institute (NEI) and NRC guidance, NUREG-0933 *"Resolution of Generic Safety Issues,"* Supplement 34 (Reference 1.7.13) and more recent NRC Generic Issue Management Control System Reports, the following GSIs are addressed for Oconee subsequent license renewal:

- GSI-186, *Potential Risk and Consequences of Heavy Load Drops*. This GSI addresses heavy load handling issues related to crane design and operation. Aging effects are not central to these issues. The issues do not involve time-limited aging analyses, including typical crane-related TLAAs such as cyclic loading analyses. GSI-186 is now closed.

- GSI-189, *Susceptibility of Ice Condenser Containments to Early Failure from Hydrogen Combustion During a Severe Accident*. This issue is not applicable to ONS. Oconee Nuclear Station, Units 1, 2, and 3 do not have ice condenser containments. GSI-189 is now closed.
- GSI-191, *Assessment of Debris Accumulation on PWR Sump Performance*. This GSI addresses the potential for blockage of containment sump strainers that filter debris from cooling water supplied to safety injection and containment spray pumps following a postulated LOCA. The issue is based on the identification of new potential sources of debris, including failed containment coatings, which may block the sump strainers. The modified containment sump strainers are evaluated with the low pressure injection system as described in Section 2.3.2.4. The protective coatings inside containment are evaluated with the reactor building as described in Section 2.4.2. The issue is not related to the 60-year term of the current operating license and is not a TLAA. This issue has been closed out for ONS.
- GSI-193, *BWR ECCS Suction Concerns*. This GSI addresses the possible failure of low pressure emergency core cooling systems due to unanticipated, large quantities of entrained gas in suction piping from the pressure suppression chamber (torus) in BWR Mark I containments. This issue is not applicable to ONS. Oconee Nuclear Station, Units 1, 2 and 3 are PWRs. GSI-193 is now closed.
- GSI-199, *Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States for Existing Plants*. This GSI addresses how current estimates of the seismic hazard level at some nuclear sites in the central and eastern United States might be higher than the values used in their original designs and previous evaluations. Aging effects are not relevant to this issue. This issue does not involve time limited aging analyses. Activities associated with this issue are covered by a 10 CFR 50.54(f) letter dated March 12, 2012 (ADAMS Accession Number ML12053A340) concerning the Japan Near Term Task Force Recommendations. By letter dated December 21, 2018 (ADAMS Accession Number ML19004A127), Duke Energy submitted a Seismic Probabilistic Risk Assessment in response to Enclosure 1, Item (8) of the 50.54(f) letter, for Oconee. The NRC Staff review of the SPRA for Oconee is provided in NRC Letter dated November 29, 2019 (ADAMS Accession Number ML19267A022). The NRC staff concluded that no further response or regulatory actions are required. This issue has been closed out for Oconee.
- GSI-204, *Flooding of Nuclear Power Plant Sites Following Upstream Dam Failures.* This GSI addresses the potential flooding effects from upstream dam failure(s) on nuclear power plant sites, spent fuel pools, and sites undergoing decommissioning with spent fuel stored in spent fuel pools. Aging effects are not central to this issue. This issue does not involve time-limited aging analyses. Activities associated with this issue are covered by the Japan Near Term Task Force Recommendations. On March 12, 2012, NRC issued a request for information (10 CFR 50.54(f) letter) in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant. Enclosure 2 to the 10 CFR 50.54(f) letter requested that licensees reevaluate flood hazards for their sites using present-day methods and regulatory guidance. As part of the response to the 10 CFR 50.54(f) letter, a flooding analysis for Oconee was provided by letter dated July 31, 2017 (ADAMS Accession Number ML17222A068). In a letter dated June 18, 2018 (ADAMS Accession Number

ML18141A755), the NRC staff concluded that Oconee has demonstrated effective flood protection exists for a beyond-design-basis external flooding event. This issue has been closed out for Oconee.

2.1.8 CONCLUSIONS

The scoping and screening methodology described above was used at ONS to identify the systems and structures that are within the scope of SLR and to identify those structures and components that are subject to an AMR. The methods are consistent with and satisfy the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

2.2 PLANT LEVEL SCOPING RESULTS

Table 2.2-1 and Table 2.2-2 lists the ONS mechanical systems and structures that were evaluated to determine if they were within the scope of SLR, using the methodology described in Section 2.1. A reference to the section of the application that contains the scoping and screening results is provided for each in-scope mechanical system and structure.

As discussed in Section 2.1.4, plant level scoping results for electrical and I&C systems are not presented since scoping is performed at a component level. All plant electrical and I&C components are included in the review unless they are specifically scoped out per 10 CFR 54.4 or screened out per 10 CFR 54.21(a)(1). The following electrical and I&C components do not perform an intended function meeting 10 CFR 54.4 and are selectively scoped out from SLR:

- Electrical components associated with the 525kV Switchyard
- Electrical components associated with the Jocassee, Calhoun, Oconee, and Dacus 230kV transmission lines
- Electrical components associated with the Radwaste Facility
- Electrical components associated with the 44kV Oconee Retail Substation
- Electrical components associated with various plant structures with no 10 CFR 54.4(a) function (i.e., structures that are not within the scope of SLR per Table 2.2-2)

Table 2.2-1 Plant-Level Scoping Results for Mechanical Systems

System, Structure, or Commodity Group	In-scope for License Renewal	Reference
Reactor Vessel, Reactor Internals, and Reactor Coolant System		
Reactor Vessel	YES	Section 2.3.1.1
Reactor Vessel Internals	YES	Section 2.3.1.2

Table 2.2-1 Plant-Level Scoping Results for Mechanical Systems

System, Structure, or Commodity Group	In-scope for License Renewal	Reference
Reactor Coolant System	YES	Section 2.3.1.3
Steam Generators	YES	Section 2.3.1.4
Control Rod Drive System	YES	Section 2.3.1.1
Incore Instrument System	YES	Section 2.3.1.1
Engineered Safety Features		
Reactor Building Spray System	YES	Section 2.3.2.1
Core Flood System	YES	Section 2.3.2.2
High Pressure Injection System	YES	Section 2.3.2.3
Standby Shutdown Facility Reactor Coolant Makeup System	YES	Section 2.3.2.3
Low Pressure Injection System	YES	Section 2.3.2.4
Auxiliary Systems		
Radwaste Facility Compressed Air System	NO	Not Applicable
Keowee Air Breaker System	YES	Section 2.3.3.1.5
Standby Shutdown Facility Air Intake and Exhaust System	YES	Section 2.3.3.10.1
Keowee Governor Air System	YES	Section 2.3.3.1.7
Auxiliary Instrument Air System	YES	Section 2.3.3.1.1

Table 2.2-1 Plant-Level Scoping Results for Mechanical Systems

System, Structure, or Commodity Group	In-scope for License Renewal	Reference
Alternate Chilled Water System	YES	Section 2.3.3.3.1
Breathing Air System	YES	Section 2.3.3.1.2
Chemical Addition System	YES	Section 2.3.3.2.1
Component Cooling Water System	YES	Section 2.3.3.3.2
Condenser Circulating Water System	YES	Section 2.3.3.9.1
Keowee Carbon Dioxide System	NO	Not Applicable
Coolant Storage System	YES	Section 2.3.3.2.2
Coolant Treatment System	YES	Section 2.3.3.2.3
Chilled Water (Non-Vital Loads) Systems	YES	Section 2.3.3.3.3
Standby Shutdown Facility Starting Air System	YES	Section 2.3.3.10.7
Standby Shutdown Facility Diesel Engine System	YES	Section 2.3.3.10.2
Standby Shutdown Facility Fuel Oil System	YES	Section 2.3.3.10.5
Standby Shutdown Facility Diesel Jacket Water Cooling System	YES	Section 2.3.3.10.3
Standby Shutdown Facility Diesel Lube Oil System	YES	Section 2.3.3.10.4

Table 2.2-1 Plant-Level Scoping Results for Mechanical Systems

System, Structure, or Commodity Group	In-scope for License Renewal	Reference
Keowee Drain System (Penstock)	NO	Not Applicable
Keowee Drain System (Unwatering)	NO	Not Applicable
Demineralized Water System	YES	Section 2.3.3.2.4
Radwaste Facility Equipment Cooling System	NO	Not Applicable
Extensive Damage Mitigation System	NO	Not Applicable
Electro-Hydraulic Control System	YES	Section 2.3.3.8.1
Essential Siphon Vacuum System	YES	Section 2.3.3.2.5
Fuel Oil System	YES	Section 2.3.3.8.2
Standby Shutdown Facility Fire Protection System	YES	Section 2.3.3.1.11
Filtered Water System	YES	Section 2.3.3.7.1
Keowee Turbine Guide Bearing Oil System	YES	Section 2.3.3.6.2
Standby Shutdown Facility Governor System	YES	Section 2.3.3.10.6
Gaseous Waste Disposal System	YES	Section 2.3.3.11.1
Hydrogen System	YES	Section 2.3.3.1.3
Keowee Generator High Pressure Oil System	YES	Section 2.3.3.8.3

Table 2.2-1 Plant-Level Scoping Results for Mechanical Systems

System, Structure, or Commodity Group	In-scope for License Renewal	Reference
High Pressure Service Water System	YES	Section 2.3.3.4.1
Standby Shutdown Facility Heating, Ventilation, and Air Conditioning System	YES	Section 2.3.3.5.3
Instrument Air System	YES	Section 2.3.3.1.4
Interim Liquid Waste Disposal System	NO	Not Applicable
Keowee Station Air System	YES	Section 2.3.3.1.8
Keowee Air Brake System	NO	Not Applicable
Keowee Depressing Air System	YES	Section 2.3.3.1.6
Keowee Fire Detection/Protection System	YES	Section 2.3.3.4.3
Keowee Instrument Air System	NO	Not Applicable
Keowee Lube Oil System	YES	Section 2.3.3.6.3
Keowee Main Turbine System	YES	Section 2.3.3.7.2
Keowee Plant Drinking Water System	YES	Section 2.3.3.7.4
Keowee Vacuum Cleaner System	NO	Not Applicable
Keowee Ventilation System	NO	Not Applicable
Liquid Waste Disposal System (Laundry & Hot Shower)	YES	Section 2.3.3.11.2

Table 2.2-1 Plant-Level Scoping Results for Mechanical Systems

System, Structure, or Commodity Group	In-scope for License Renewal	Reference
Lube Oil System	YES	Section 2.3.3.6.1
Low Pressure Service Water System	YES	Section 2.3.3.9.2
Leak Rate Test System	YES	Section 2.3.3.7.3
Radwaste Facility Liquid Waste and Recycle System	NO	Not Applicable
Liquid Waste Disposal System	YES	Section 2.3.3.11.2
Nitrogen Purge and Blanket System	YES	Section 2.3.3.1.9
Keowee Governor Oil System	YES	Section 2.3.3.8.4
Post-Accident Sampling System	YES	Section 2.3.3.2.1
Plant Drinking Water System	YES	Section 2.3.3.7.4
Reactor Building Purge System	YES	Section 2.3.3.5.2
Penetration Room Ventilation System	YES	Section 2.3.3.5.3
Protected Service Water System	YES	Section 2.3.3.9.3
Radwaste Facility Auxiliary Steam System	NO	Not Applicable
Reactor Building Cooling System	YES	Section 2.3.3.5.1
Recirculating Cooling Water System	YES	Section 2.3.3.3.4

Table 2.2-1 Plant-Level Scoping Results for Mechanical Systems

System, Structure, or Commodity Group	In-scope for License Renewal	Reference
Refueling System	YES	Section 2.3.3.8.5
Radiation Monitoring System	YES	Section 2.3.3.7.5
Radwaste Facility Plant Heating System	NO	Not Applicable
Radwaste Facility Powdered Resin Recovery System	NO	Not Applicable
Radwaste Facility Seal Water System	NO	Not Applicable
Service Air System	YES	Section 2.3.3.1.10
Standby Shutdown Facility Auxiliary Service Water System	YES	Section 2.3.3.9.1
Stator Coolant System	YES	Section 2.3.3.7.6
Sample Cooling Water System	YES	Section 2.3.3.3.5
Spent Fuel Cooling System	YES	Section 2.3.3.2.6
Hydrogen Seal Oil System	YES	Section 2.3.3.8.6
Standby Shutdown Facility Drinking Water System	YES	Section 2.3.3.7.4
Standby Shutdown Facility Sanitary Lift System	YES	Section 2.3.3.7.7
Siphon Seal Water System	YES	Section 2.3.3.9.4
Station Sewage Disposal System	YES	Section 2.3.3.7.7

Table 2.2-1 Plant-Level Scoping Results for Mechanical Systems

System, Structure, or Commodity Group	In-scope for License Renewal	Reference
Standby Shutdown Facility Sump System	YES	Section 2.3.3.9.1
Keowee Service Water System	YES	Section 2.3.3.4.2
Tendon Access Gallery Sump Pump System	NO	Not Applicable
Turbine Building Sumps System	YES	Section 2.3.3.9.1
Keowee Turbine Sump Pump System	YES	Section 2.3.3.7.8
Vacuum System	YES	Section 2.3.3.7.9
Auxiliary Building Ventilation System	YES	Section 2.3.3.5.3
Auxiliary Building Air Conditioning System	YES	Section 2.3.3.5.3
Administration Building Air System	NO	Not Applicable
Control Room Pressurization and Filtration System	YES	Section 2.3.3.5.3
Miscellaneous Structures Heating, Ventilation, and Air Conditioning System	YES	Section 2.3.3.5.3
Radwaste Facility Volume Reduction System	NO	Not Applicable
Reactor Building Ventilation System	YES	Section 2.3.3.5.1
Radwaste Facility HVAC System	NO	Not Applicable
Service Building Ventilation System	NO	Not Applicable

Table 2.2-1 Plant-Level Scoping Results for Mechanical Systems

System, Structure, or Commodity Group	In-scope for License Renewal	Reference
Spent Fuel Pool Area Ventilation System	YES	Section 2.3.3.5.3
Turbine Building Ventilation System	YES	Section 2.3.3.5.3
Chilled Water (Vital Loads) System	YES	Section 2.3.3.3.6
Keowee Turbine Generator Cooling Water System	YES	Section 2.3.3.9.5
Steam and Power Conversion Systems		
Auxiliary Steam System	YES	Section 2.3.4.7
Main Steam System	YES	Section 2.3.4.8
Turbine and Auxiliaries System	YES	Section 2.3.4.9
Plant Heating System	YES	Section 2.3.4.10
Steam Drain System	YES	Section 2.3.4.11
Steam Seal System	YES	Section 2.3.4.12
Condensate System	YES	Section 2.3.4.1
Feedwater System	YES	Section 2.3.4.2
Emergency Feedwater System	YES	Section 2.3.4.2
Heater Drain System	YES	Section 2.3.4.3
High Pressure Turbine Exhaust System	YES	Section 2.3.4.4

Table 2.2-1 Plant-Level Scoping Results for Mechanical Systems

System, Structure, or Commodity Group	In-scope for License Renewal	Reference
Low Pressure Turbine Extraction System	YES	Section 2.3.4.6
Heater Vent System	YES	Section 2.3.4.5

Table 2.2-2 Plant Level Scoping Results for Structures

System, Structure, or Commodity Group	In-Scope for License Renewal	Reference
Containments, Structures, and Component Supports		
100 KV Structure	YES	Section 2.4.5
230 KV Relay House	YES	Section 2.4.5
230 KV Switchyard Structure	YES	Section 2.4.5
525 KV Relay House	NO	Not Applicable
525 KV Switchyard Structure	NO	Not Applicable
Administration Building	YES	Section 2.4.7.15
Auxiliary Building (Units 1 and 2 (shared), Unit 3)	YES	Section 2.4.1
Borated Water Storage Tank Superstructure	YES	Section 2.4.7.1
Breaker Vault (Keowee)	YES	Section 2.4.4
Canteen Facility	NO	Not Applicable
Chemical Treatment Pond	NO	Not Applicable

Table 2.2-2 Plant Level Scoping Results for Structures

System, Structure, or Commodity Group	In-Scope for License Renewal	Reference
Discharge Structure (A14)	NO	Not Applicable
Dry Cask Modular Storage	NO	Not Applicable
Elevated Water Storage Tank Structure	YES	Section 2.4.7.10
Essential Siphon Vacuum Building	YES	Section 2.4.7.2
Health Physics Office Building	YES	Section 2.4.7.14
Hot Machine Shop	YES	Section 2.4.1
Hydrogen Storage House	NO	Not Applicable
Instrumentation Facility	NO	Not Applicable
Intake Canal Dike	YES	Section 2.4.6
Intake Structure (A04)	YES	Section 2.4.7.3
Intake Structure Keowee (A11)	YES	Section 2.4.4
Interim Radwaste Building	NO	Not Applicable
Keowee River Dam	YES	Section 2.4.6
Lead Molding/Welding Stress Facility	NO	Not Applicable
Little River Dam	YES	Section 2.4.6
Maintenance Support Building	NO	Not Applicable
Meteorological Tower (#1)	NO	Not Applicable

Table 2.2-2 Plant Level Scoping Results for Structures

System, Structure, or Commodity Group	In-Scope for License Renewal	Reference
Meteorological Tower (#2)	NO	Not Applicable
Microwave and Meteorological Tower	NO	Not Applicable
Microwave House Structure	YES	Section 2.4.7.11
Nitrogen Storage House	NO	Not Applicable
Office Building - Admin	NO	Not Applicable
Office Building - Oconee	NO	Not Applicable
Oil Drum Storage	NO	Not Applicable
Penstock (Keowee)	YES	Section 2.4.4
Power House (Keowee)	YES	Section 2.4.4
Protected Service Water Building	YES	Section 2.4.7.4
Radiographics Shooting Vault	NO	Not Applicable
Radiography Office	NO	Not Applicable
Radwaste Facility	YES	Section 2.4.7.7
Reactor Building (Units 1, 2, and 3)	YES	Section 2.4.2
Reactor Coolant Pump Refurbishment Building	NO	Not Applicable
RP Office Building	NO	Not Applicable
RP TRD Equipment Building	NO	Not Applicable

Table 2.2-2 Plant Level Scoping Results for Structures

System, Structure, or Commodity Group	In-Scope for License Renewal	Reference
Security Building	NO	Not Applicable
Service Bay Structure (Keowee)	YES	Section 2.4.4
Service Building	NO	Not Applicable
Spent Fuel Pool (Unit 1 and 2 shared)	YES	Section 2.4.1
Spent Fuel Pool (Unit 3)	YES	Section 2.4.1
Spillway (A12) (Keowee)	YES	Section 2.4.4
Standby Shutdown Facility (structure)	YES	Section 2.4.7.6
Station Support Complex	NO	Not Applicable
Storage Facility	NO	Not Applicable
Technical Support Building	YES	Section 2.4.7.9
Trenches (1, 2, and 3)	YES	Section 2.4.7.8
Turbine Building (1, 2, and 3)	YES	Section 2.4.3
Underwater Weir	NO	Not Applicable
Unit 1 and 2 Switchgear Enclosure (Blockhouses)	YES	Section 2.4.3
Unit 3 Switchgear Enclosure (Blockhouses)	YES	Section 2.4.3
Unit Vent (Units 1, 2 and 3)	YES	Section 2.4.2
Warehouse 8090	NO	Not Applicable

Table 2.2-2 Plant Level Scoping Results for Structures

System, Structure, or Commodity Group	In-Scope for License Renewal	Reference
Warehouse 8093	NO	Not Applicable
Warehouse 8096	NO	Not Applicable
Warehouse 8019	NO	Not Applicable
Weld Fabrication Shops	NO	Not Applicable

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

2.3.1 REACTOR VESSEL, REACTOR INTERNALS AND REACTOR COOLANT SYSTEM

2.3.1.1 Reactor Vessel

System Description

The Unit 1, 2, and 3 reactor vessels are categorized as B&W lowered loop reactor vessels. Each reactor vessel consists of a cylindrical shell, a spherically dished bottom head, and a ring flange to which a removable reactor closure head is bolted. Each reactor vessel is supported by a cylindrical support skirt.

The original reactor vessel heads were replaced in 2003-2004 because of cracking discovered in a number of penetration nozzles. Each replacement reactor vessel closure head is a one-piece low alloy steel forging clad with stainless steel. All internal surfaces of the reactor vessel and closure head are clad with stainless steel or nickel-chromium-iron weld deposit. The replacement penetration nozzles are made from Alloy 690 which are more resistant to primary water stress corrosion cracking than the original Alloy 600 nozzles.

All major reactor vessel nozzles are installed with full penetration welds. All control rod drive and incore instrumentation nozzles are installed with partial penetration welds. The gasket leakage tap is installed in each reactor vessel flange with a partial penetration weld. The reactor vessels are constructed of a combination of formed plates and forgings.

The core support assembly is supported by a ledge on the inside of the vessel flanges, and its location is maintained on this elevation by the closure head flange. The core support assembly directs coolant flow through the reactor vessel and core, supports the core, and guides the control rods in the withdrawn position.

The vessel has two outlet nozzles through which the reactor coolant is transported to the steam generators and four inlet nozzles through which reactor coolant reenters the reactor vessel. Two smaller nozzles located between the reactor coolant inlet nozzles serve as inlets for decay heat cooling and emergency cooling water injection (core flooding and low pressure injection engineered safety features functions). The reactor coolant and the control rod drive penetrations are located above the top of the core to maintain a flooded core in the event of a rupture in a reactor coolant pipe or a control rod drive pressure housing. The reactor vessel is vented through the control rod drives.

The bottom head of the vessel is penetrated by instrumentation nozzles. The closure head is penetrated by flanged nozzles which provide for attaching the control rod drive mechanisms and for control rod extension shaft movement.

Guide lugs welded inside the reactor vessel's lower head limit a vertical drop of the reactor internals and core to 1/2 inch or less and prevent rotation about the vertical axis in the unlikely event of a major internals component failure.

The reactor vessel shell material is protected from fast neutron flux and gamma heating effects by a series of water annuli and stainless steel barriers located between the core and the vessel's wall. The interior surface of the shell assembly is clad with austenitic stainless steel weld deposits, except for a horizontal band underneath the guide lugs which is clad with Alloy 82/182. The 12 Alloy 600 guide lugs are welded at equal spacings to the Alloy 82/182 cladding along the bottom of the inner surface of the lower shell assembly.

System Intended Functions

Portions of the reactor vessel are relied upon to maintain the reactor coolant system pressure boundary and provide structural support for the reactor vessel internals and core. Therefore, the reactor vessel is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the reactor vessel are relied upon for compliance with regulations for fire protection (10 CFR 50.48), PTS (10 CFR 50.61), EQ (10 CFR 50.49), ATWS (10 CFR 50.62) and SBO (10 CFR 50.63). Therefore, the reactor vessel is within the scope of SLR in accordance with 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the reactor vessel can be found in the UFSAR Section 5.3, Figures 5-1, 5-2, 5-14, 5-15, and 5-16, and Table 5-11.

System Evaluation Boundary

The evaluation boundary for the reactor vessel components subject to aging management includes the reactor vessel shell, lower vessel head, closure head, nozzles (and safe ends, if provided), interior attachments, and all associated pressure retaining bolting.

Subsequent License Renewal Boundary Drawings

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

To ensure an entire system has been analyzed, both primary and secondary drawings are displayed for the given systems below:

Primary Drawings

- OSLRD-100A-1.1
- OSLRD-100A-2.1
- OSLRD-100A-3.1

Secondary Drawings

- None

The SLR evaluation boundaries of the reactor vessel include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.1-1, Reactor Vessel.

Table 2.3.1-1 Reactor Vessel

Component/Commodity Group	Intended Functions
Beltline Welds	Pressure Boundary
Bottom Head	Pressure Boundary Structural Support
Closure Head Dome and Flange	Pressure Boundary Structural Support
Closure Head Lifting Lugs	Pressure Boundary Structural Support
Closure Head Stud Assembly	Pressure Boundary
Control Rod Drive Mechanism Closure Insert And Vent Assemblies	Pressure Boundary

Table 2.3.1-1 Reactor Vessel

Component/Commodity Group	Intended Functions
Control Rod Drive Mechanism Guide Tube Welding To Closure Head	Pressure Boundary Structural Support
Control Rod Drive Mechanism Head Penetration Flange Bolting	Pressure Boundary
Control Rod Drive Mechanism Motor Tube Assembly	Pressure Boundary
Control Rod Drive Mechanism Nozzle Adaptor Flange	Pressure Boundary Structural Support
Control Rod Drive Mechanism Nozzle Body	Pressure Boundary
Control Rod Drive Mechanism Nozzle Body To Nozzle Adaptor Flange Weld	Pressure Boundary Structural Support
Core Flood Nozzle Flow Restrictors	Pressure Boundary Flow Restriction
Core Flood Nozzle Safe Ends	Pressure Boundary
Core Flood Nozzle Thermal Sleeve	Thermal Resistance
Core Flood Nozzle Weld	Pressure Boundary
Core Flood Nozzles	Pressure Boundary
Core Guide Lugs	Structural Support
Head Vent Pipe	Pressure Boundary
Incore Monitoring System Lines	Pressure Boundary
Inlet and Outlet Nozzles	Pressure Boundary
Instrument Tubes (bottom head)	Pressure Boundary

Table 2.3.1-1 Reactor Vessel

Component/Commodity Group	Intended Functions
Lower Nozzle Belt Forging	Pressure Boundary
Lower Shell Plate	Pressure Boundary Structural Support
Support Skirt	Structural Support
Transition Forging	Pressure Boundary Structural Support
Upper Nozzle Belt Forging	Pressure Boundary
Upper Shell Flange	Pressure Boundary
Upper Shell Plate	Pressure Boundary
Vessel Flange Leak Detection Line	Structural Integrity
Vessel Flange Leak Detection Line Tap Weld	Structural Integrity

The AMR results for these component types are indicated in Table 3.1.2-1, Reactor Vessel, Reactor Internals and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation.

2.3.1.2 Reactor Vessel Internals

System Description

The reactor vessel internals are designed to support the core, maintain fuel assembly alignment, limit fuel assembly movement, and maintain control rod assembly guide tube alignment between fuel assemblies and control rod drives. They also direct the flow of reactor coolant, provide gamma and neutron shielding, provide guides for incore instrumentation between the reactor vessel lower head and the fuel assemblies, and support the internals vent valves. The vent valves are designed to vent the steam generated within the core, thereby permitting the rapid re-covering of the core by coolant following a reactor coolant inlet pipe rupture. All reactor internal components can be removed from the reactor vessel to allow inspection of the reactor internals and the reactor vessel internal surface.

The reactor vessel internal components include the plenum assembly and the core support assembly. The core support assembly consists of the core support shield, vent valves, core barrel, lower grid, flow distributor, incore instrumentation guide tubes, and thermal shield. The plenum assembly consists of the upper grid plate, the control rod guide assemblies, and a plenum cover. Reactor vessel internals do not include fuel assemblies, control rod assemblies, or incore instrumentation.

To minimize lateral deflection of the lower end of the core support assembly as a result of horizontal seismic loading, integral weld-attached, deflection-limiting guide lugs are welded on the reactor vessel inside wall. These blocks limit the rotation of the lower end of the core support assembly which could result from flow-induced torsional loadings. The lugs allow free vertical movement of the lower end of the internals for thermal expansion throughout all ranges of reactor operating conditions. In the unlikely event that a flange, circumferential weld, or bolted joint might fail, the lugs limit the possible core drop to 1/2 inch or less. The elevation plane of these lugs was established near the elevation of the vessel support skirt attachment to minimize dynamic loading effects on the vessel shell or bottom head. A 1/2 inch core drop does not allow the lower end of the control rod assembly rods to disengage from their respective fuel assembly guide tubes, even if the control rod assemblies are in the full position. In this rod position, approximately 6 1/2 inches of rod length remains in the fuel assembly guide tubes. A core drop of 1/2 inch does not result in a significant reactivity change. The core cannot rotate and bind the drive lines, because rotation of the core support assembly is prevented by the guide lugs.

System Intended Functions

Portions of the reactor vessel internals are relied upon to provide support and orientation of the reactor core and control rod assemblies. The reactor vessel internals also provide a passageway for distribution of the reactor coolant flow, guidance and protection for the incore instrumentation, secondary support for limiting the downward displacement of the core support structure in the event of a postulated failure of the core barrel, and gamma and neutron shielding. Therefore, the reactor vessel internals are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

UFSAR References

Additional details of the reactor vessel internals can be found in the UFSAR Section 4.5.1.3 and Figures 4-26, 4-27, and 4-28.

System Evaluation Boundary

The evaluation boundary for the reactor vessel internals system components includes the two major structural sub-assemblies that are located within, but not integrally attached to (i.e., not welded to) the reactor vessel. These major sub-assemblies are the plenum assembly and the core support assembly. For the purpose of defining materials, fasteners, construction, and assembly, the core support assembly may be further divided into seven sub-assemblies as defined in UFSAR Section 4.5.1.3.2: the core support shield assembly, the core barrel assembly, the lower grid assembly, the flow distributor, the thermal shield, the incore instrument guide tube assembly, and the internals vent valves. The mechanical fasteners (bolting) joining these sub-assemblies and associated items are within the evaluation boundary. The evaluation boundary also includes the major structural welds that form or join the major sub-assembly cylinders and flanges and minor structural welds joining parts such as lifting lugs, support pipes and tubes to the major sub-assemblies.

Subsequent License Renewal Boundary Drawings

No SLR boundary drawings are provided for the reactor vessel internals.

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.1-2, Reactor Vessel Internals.

Table 2.3.1-2 Reactor Vessel Internals

Component/Commodity Group	Intended Functions
Bottom Flange-to-Upper Grid Screws	Core Support
Baffle/Former Bolts and Screws (including dowels, baffle-to-former bolts, locking pins, baffle-to-former shoulder screws, locking dowel, baffle-to-baffle bolts, locking rings, and barrel-to-former cap screws)	Core Support
Baffle Plates and Formers (including baffle plates and former plates)	Core Support
Clamping Ring	Core Support
Control Rod Guide Tube Spacer Casting	Core Support
Control Rod Guide Tube Spacer Screws (including spacer casting screws and spacer casting washers)	Core Support
Core Barrel Cylinder (including core barrel cylinders, top flange, and bottom flange)	Core Support
Core Barrel-to-Thermal Shield Bolts (including thermal shield-to-core barrel bolts, thermal shield-to-core barrel locking clips, and thermal shield cap screws)	Core Support
Core Support Shield Cylinder (including cylinder, top flange, bottom flange, flow deflectors, round bars, and lifting lugs)	Core Support

Table 2.3.1-2 Reactor Vessel Internals

Component/Commodity Group	Intended Functions
Core Support Shield-to-Core Barrel Bolts (including core support shield-to-core barrel bolts and core support shield-to-core barrel bolts locking cups and tie plates)	Core Support
Control Rod Guide Tube Flange-to-Upper Grid Screws (including flange-to-upper grid bolts and dowel)	Core Support
Control Rod Guide Tube Pipe and Flange (including pipe and flange)	Core Support
Control Rod Guide Tube Rod Guide Sectors	Core Support
Control Rod Guide Tube Rod Guide Tubes	Core Support
Flow Distributor Head and Flange (including head, flange, and dowels)	Core Support
Fuel Assembly Support Pads (lower grid assembly) (including fuel assembly support pads, dowels, and cap screws)	Core Support
Fuel Assembly Support Pads (upper grid assembly) (including fuel assembly support pads, dowels, and cap screws)	Core Support
Guide Blocks and Bolts (including guide blocks, guide block bolts, guide block washers, and dowels)	Core Support
Incore Guide Support Plate	Core Support
Incore Guide Tube Components (including IMI guide tubes, gussets, guide tube nuts, guide tube washers, and locking clips)	Core Support
Incore Guide Tube Spider Castings	Core Support
Lower Grid and Shell Forgings (including lower grid forging and lower grid shell forging)	Core Support
Lower Grid Flow Distributor Plate	Core Support

Table 2.3.1-2 Reactor Vessel Internals

Component/Commodity Group	Intended Functions
Lower Grid Rib Section	Core Support
Lower Grid Rib-to-Shell Forging Screws (including rib-to-shell forging cap screws, and rib-to-shell forging cap screws locking pins)	Core Support
Lower Internals Assembly-to-Core Barrel Bolts (including lower grid assembly-to-core barrel bolts and lower grid assembly-to-core barrel bolts locking clips)	Core Support
Lower Internals Assembly-to-Thermal Shield Bolts (including lower grid assembly-to-thermal shield studs/nuts and lower grid assembly-to-thermal shield bolts/studs/nuts locking cups and tie plates)	Core Support
Orifice Plugs	Core Support
Outlet and Vent Valve Nozzles	Core Support
Plenum Cover Assembly (including weldment ribs, bottom flange, support flange, support ring, cover plate, lifting lugs, base blocks, lifting lug-to-base block bolts, and locking clips)	Core Support
Plenum Cylinder	Core Support
Plenum Rib Pads	Core Support
Reinforcing Plates	Core Support
Rib-to-Ring Screws (including rib-to-ring cap screws and locking pins)	Core Support
Shell Forging-to-Flow Distributor Bolts (including flow distributor-to-shell forging bolts and flow distributor-to-shell forging bolts locking clip)	Core Support
Shock Pads and Bolts (including shock pads and shock pad bolts)	Core Support

Table 2.3.1-2 Reactor Vessel Internals

Component/Commodity Group	Intended Functions
Support Post Pipes (including support post pipes, bolting plugs, and support post cap screws)	Core Support
Surveillance Specimen Holder Bolts (including surveillance specimen holder tube-to-thermal shield studs/nuts and surveillance specimen holder tube-to-thermal shield bolts locking cups and tie plates)	Core Support
Thermal Shield (including thermal shield cylinders, thermal shield restraint “A” and “B” blocks, thermal shield shims, thermal shield restraint hardfacing, thermal shield plugs, and thermal shield dowels)	Core Support
Top Flange-to-Cover Bolts (including top flange-to-cover bolts and locking cups)	Core Support
Upper Grid Rib Forging	Core Support
Upper Grid Rib Section	Core Support
Vent Valve Assembly Locking Devices	Core Support
Vent Valve Body and Retaining Rings (including vent valve guide blocks, vent valve body, vent valve retaining rings, and vent valve jack screws)	Core Support Flow Restriction

The AMR results for these component types are indicated in Table 3.1.2-2, Reactor Vessel, Reactor Internals and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation.

2.3.1.3 Reactor Coolant System

System Description

The reactor coolant system consists of the reactor vessel, two vertical steam generators, four shaft-sealed reactor coolant pumps, an electrically heated pressurizer and interconnecting piping. The system is arranged in two heat transport loops, each with two reactor coolant pumps and one steam generator. The reactor coolant is transported through piping connecting the reactor vessel to the steam generators and flows downward through the steam generator tubes transferring heat to the steam and water on the shell side of the steam generator. In each loop, the reactor coolant is returned to the reactor through two lines, each containing a reactor coolant pump, to the reactor vessel. In addition to serving as a heat transport medium, the coolant also serves as a neutron moderator and reflector, and a solvent for the soluble poison (boron in the form of boric acid).

The ONS Unit 2 and 3 reactor coolant pumps are Bingham pumps in agreement with the original design. Because of manufacturing delays, Westinghouse Model 93A pumps were substituted for ONS Unit 1 only. For Unit 1, the reactor coolant piping was modified slightly to accommodate the substituted pumps. The flow configuration for both sets of pumps is the same with both the substituted Unit 1 pumps and the Unit 2 and 3 pumps being bottom suction and side discharge. The original motors were utilized for the pumps on all three units.

During normal operation, the reactor coolant pumps circulate coolant through the reactor vessel and steam generators. The coolant is heated by the reactor core inside the reactor vessel, and is cooled by the steam generators which transfer the heat to the main steam system. Pressure in the reactor coolant system is maintained above the saturation pressure of the reactor coolant in order to prevent departure from nucleate boiling in the reactor core and cavitation in the reactor coolant pumps.

Reactor coolant system pressure is controlled and maintained in the pressurizer. Steam and water are kept in thermal equilibrium inside the pressurizer by the coordinated operation of electric heaters and a subcooled water spray. Pressurizer heaters are sequenced on in stages when system pressure decreases below normal and are sequenced off as the pressure recovers. Similarly, the spray of subcooled water into the pressurizer vapor space is increased when system pressure rises above normal and is reduced as the pressure decreases toward normal. These features maintain system pressure during normal operation and limit pressure variations due to plant transients.

System Intended Functions

Portions of the reactor coolant system are relied upon to maintain containment and reactor coolant pressure boundary integrity. Portions of the reactor coolant system are relied upon to provide core decay, latent and reactor coolant pump heat removal during normal operations, shutdown, and following a design basis event. The reactor coolant system also provides venting of non-condensible gases and steam following postulated design basis events, and indication and isolation of the reactor coolant system boundary to prevent inventory loss. Therefore, the reactor coolant system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the reactor coolant system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the reactor coolant system provide low temperature overpressure protection. Portions of the reactor coolant system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the reactor coolant system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(2).

Portions of the reactor coolant system are relied upon for compliance with regulations for fire protection (10 CFR 50.48), EQ (10 CFR 50.49), SBO (10 CFR 50.63), and ATWS (10 CFR 50.62). Therefore, the reactor coolant system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the reactor coolant system can be found in the UFSAR Section 5.1, Figures 5-1, 5-2, 5-3, 5-4, 5-5, 5-6, 5-7, 5-8, and Tables 5-20, 5-21, and 5-22.

System Evaluation Boundary

The Class 1 reactor coolant system boundary includes all pipes, fittings, branch connections, safe ends, thermal sleeves, flow restricting orifices, and pressure retaining parts of valves and associated bolting. This includes the main coolant piping, pressurizer surge piping, pressurizer spray piping, incore monitoring system, vents, drains, instrumentation lines, and Class 1 sections of ancillary systems attached to the main coolant piping and reactor coolant pumps. Ancillary systems include low pressure injection, core flood, high pressure injection, and chemical addition and sampling.

The Class 1 reactor coolant system boundary extends to either the first or second isolation valve within the ancillary piping: that is, low pressure injection/core flood injection (including decay heat drop line and dump-to-sump), high pressure injection letdown piping, and chemical addition and sampling piping.

Subsequent License Renewal Boundary Drawings

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

To ensure an entire system has been analyzed, both primary and secondary drawings are displayed for the given systems below:

Primary Drawings

- OSLRD-100A-1.1
- OSLRD-100A-1.2
- OSLRD-100A-1.3
- OSLRD-100A-1.4
- OSLRD-100A-1.5
- OSLRD-100A-2.1
- OSLRD-100A-2.2
- OSLRD-100A-2.3
- OSLRD-100A-2.4
- OSLRD-100A-2.5
- OSLRD-100A-3.1
- OSLRD-100A-3.2
- OSLRD-100A-3.3
- OSLRD-100A-3.4
- OSLRD-100A-3.5

Secondary Drawings

- None

The SLR evaluation boundaries of the reactor coolant system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.1-3, Reactor Coolant System.

Table 2.3.1-3 Reactor Coolant System

Component/Commodity Group	Intended Functions
Flexible Metal Hose	Pressure Boundary Structural Integrity
Insulation (nuclear instrumentation)	Thermal Resistance
Insulation (pressurizer)	Thermal Resistance
Non-Reactor Coolant Pressure Boundary Reactor Coolant Bolting	Pressure Boundary Structural Integrity
Non-Reactor Coolant Pressure Boundary Reactor Coolant Piping	Pressure Boundary Structural Integrity

Table 2.3.1-3 Reactor Coolant System

Component/Commodity Group	Intended Functions
Non-Reactor Coolant Pressure Boundary Valves	Pressure Boundary Structural Integrity
Pressurizer; Heater Belt Forgings	Pressure Boundary
Pressurizer; Heater Bundle Cover Plate	Pressure Boundary
Pressurizer; Heater Bundle Diaphragm Plate	Pressure Boundary
Pressurizer; Heater Bundle Studs and Nuts	Pressure Boundary
Pressurizer; Immersion Heater End Plug	Pressure Boundary
Pressurizer; Immersion Heater Sheath	Pressure Boundary
Pressurizer; Level Sensing Nozzles	Pressure Boundary
Pressurizer; Lower Head	Pressure Boundary
Pressurizer; Manway	Pressure Boundary
Pressurizer; Manway Covers/Inserts	Pressure Boundary
Pressurizer; Manway Studs and Nuts	Pressure Boundary
Pressurizer; Pressure Relief Nozzle	Pressure Boundary
Pressurizer; Pressure Relief Nozzle Weld	Pressure Boundary
Pressurizer; Sampling Nozzle	Pressure Boundary
Pressurizer; Sampling Nozzle and Level Sensing Nozzle Safe Ends	Pressure Boundary
Pressurizer; Shell	Pressure Boundary
Pressurizer; Spray Head	Pressure Boundary

Table 2.3.1-3 Reactor Coolant System

Component/Commodity Group	Intended Functions
Pressurizer; Spray Line Nozzle	Pressure Boundary
Pressurizer; Spray Line Nozzle Safe End and Weld	Pressure Boundary
Pressurizer; Spray Line Nozzle Thermal Sleeve	Thermal Resistance
Pressurizer; Support Plate Assemblies	Structural Support
Pressurizer; Surge Line Nozzle	Pressure Boundary
Pressurizer; Surge Line Nozzle Safe End	Pressure Boundary
Pressurizer; Surge Line Nozzle Safe End Weld	Pressure Boundary
Pressurizer; Surge Line Nozzle Thermal Sleeve	Thermal Resistance
Pressurizer; Thermowell	Pressure Boundary
Pressurizer; Upper Head	Pressure Boundary
Pressurizer; Vent Nozzles	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Class 1 Piping, Fittings, and Branch Connections < NPS 4	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Class 1 Valve Bodies	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Closure Bolting	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Core Flood Line	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line	Pressure Boundary

Table 2.3.1-3 Reactor Coolant System

Component/Commodity Group	Intended Functions
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line Nozzle	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line Nozzle Weld	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line Safe End	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Flow Meter Assembly	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Flow Meter Branch Connections	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; High Point Vent and Post Accident Sampling Flow Restrictors	Pressure Boundary Flow Restriction
Reactor Coolant Pressure Boundary Piping; High Pressure Injection System Makeup and Letdown Line Safe Ends	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; High Pressure Injection System Makeup and Letdown Line Welds	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; High Pressure Injection System Makeup and Letdown Lines	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; High Pressure Injection Thermal Sleeves	Thermal Resistance
Reactor Coolant Pressure Boundary Piping; Hot Leg	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Hot Leg High Point Vent Branch Connection	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Hot Leg Instrumentation and RTE Connections	Pressure Boundary

Table 2.3.1-3 Reactor Coolant System

Component/Commodity Group	Intended Functions
Reactor Coolant Pressure Boundary Piping; Hot Leg Surge Line Nozzle	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Hot Leg Surge Line Nozzle Safe End	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Hot Leg Surge Line Nozzle Weld	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Reactor Coolant Pump Safe End Welds	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Reactor Coolant Pump Safe Ends	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Spray Line	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Surge Line	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Upper and Lower Cold Leg	Pressure Boundary
Reactor Coolant Pressure Boundary Piping; Upper and Lower Cold Leg Drain, Instrumentation, and RTE Connections	Pressure Boundary
Reactor Coolant Pump; Oil Lift Pumps	Pressure Boundary
Reactor Coolant Pump; Studs and Nuts	Pressure Boundary
Reactor Coolant Pump; Thermowells	Pressure Boundary
Reactor Coolant Pumps; Casings and Covers	Pressure Boundary

The AMR results for these component types are indicated in Table 3.1.2-3, Reactor Vessel, Reactor Internals and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation.

2.3.1.4 Steam Generators

System Description

The steam generators supply superheated steam and provide a barrier to prevent fission products and activated corrosion products from entering the main steam system.

The original steam generators were replaced by B&W Canada between 2003-2004. The steam generator is a once-through, vertical, straight tube, tube-and-shell heat exchanger which produces superheated steam at constant pressure over the power range. Reactor coolant flows downward through the tubes and transfers heat to generate steam on the shell side. The high pressure (reactor coolant pressure) parts of the unit are the hemispherical heads, the tubesheets, and the tubes between the tubesheets. Tube support plates maintain the tubes in a uniform pattern along their length. The steam generators are supported by a pedestal.

The shell, the outside of the tubes, and the tubesheets form the boundaries of the steam-producing section of the vessel. Within the shell, the tube bundle is surrounded by a cylindrical baffle. There are openings in the baffle at the feedwater inlet nozzle elevation to provide a path for steam to afford contact feedwater heating. The upper part of the annulus formed by the baffle plate and the shell is the superheat steam outlet, while the lower part is the feedwater inlet heating zone.

Secondary side nozzles (vent, drain, and instrumentation nozzles) and inspection handholes are provided on the shell side of the unit. The reactor coolant side has manway openings in both the top and bottom heads. The steam generators have a flat bottom lower head that eliminated the need for a drain nozzle. Venting of the reactor coolant side of the unit is accomplished by a vent connection on the reactor coolant inlet pipe to each unit.

Feedwater or emergency feedwater is supplied to the steam generator through an emergency feedwater ring located at the top of the steam generator to ensure natural circulation of the reactor coolant following the unlikely event of the loss of all reactor coolant pumps.

System Intended Functions

Portions of the steam generators are relied upon to maintain the primary and secondary pressure boundaries and to transfer heat from the primary fluid to the secondary fluid. Therefore, the steam generators are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the steam generators are relied upon for compliance with regulations for fire protection (10 CFR 50.48), EQ (10 CFR 50.49), SBO (10 CFR 50.63), and ATWS (10 CFR 50.62). Therefore, the steam generators are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the steam generators can be found in UFSAR Section 5.4.2, Figure 5-25, and Table 5-20.

System Evaluation Boundary

The evaluation boundary for the steam generator components includes the hemispherical heads, secondary shell, tubes, plugs, mechanical sleeves, tubesheets, primary nozzles, main and auxiliary feedwater nozzles, steam outlet nozzles, instrumentation nozzles, main and auxiliary feedwater nozzles, steam outlet nozzles, instrumentation nozzles, all associated pressure retaining bolting, and integral attachments. The main and auxiliary feedwater headers and riser piping are non-Class 1 items and are addressed in Section 2.3.4.

Subsequent License Renewal Boundary Drawings

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

To ensure an entire system has been analyzed, both primary and secondary drawings are displayed for the given systems below:

Primary Drawings

- OSLRD-100A-1.1
- OSLRD-100A-2.1
- OSLRD-100A-3.1

Secondary Drawings

- None

The SLR evaluation boundaries of the steam generators include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.1-4, Steam Generators.

Table 2.3.1-4 Steam Generators

Component/Commodity Group	Intended Functions
Auxiliary Feedwater and Main Feedwater Closure Bolting	Pressure Boundary
Auxiliary Feedwater Nozzle Flanges	Pressure Boundary
Auxiliary Feedwater Nozzle Inlet Header	Pressure Boundary
Auxiliary Feedwater Nozzle Thermal Sleeves	Thermal Resistance
Baffle Assemblies	Structural Support
Base Support	Structural Support
Main Feedwater Nozzle Inlet Headers	Pressure Boundary
Main Feedwater Nozzle Spray Plates	Pressure Boundary
Main Feedwater Spray Nozzle Flanges	Pressure Boundary
Primary Manway and Inspection Opening Bolting	Pressure Boundary
Primary Manway and Inspection Opening Covers and Backing Plates	Pressure Boundary
Primary Nozzles	Pressure Boundary
Secondary Manway and Handhole Opening Bolting	Pressure Boundary
Secondary Manway and Handhole Opening Covers	Pressure Boundary
Secondary Side Nozzles (vent, drain, and instrumentation)	Pressure Boundary
Shell Assembly	Pressure Boundary

Table 2.3.1-4 Steam Generators

Component/Commodity Group	Intended Functions
Steam Outlet Nozzle	Pressure Boundary
Tube Plugs	Pressure Boundary
Tube Support Plate Assembly (spacers, nuts, keys, and wedges)	Structural Support
Tube Support Plate Assembly (support rods)	Structural Support
Tube Support Plate Assembly (tube support plates)	Structural Support
Tubes	Heat Transfer Pressure Boundary
Tubesheet	Pressure Boundary
Tube-to-Tubesheet Welds	Structural Support
Upper and Lower Heads	Pressure Boundary

The AMR results for these component types are indicated in Table 3.1.2-4, Reactor Vessel, Reactor Internals and Reactor Coolant System - Steam Generators - Aging Management Evaluation.

2.3.2 ENGINEERED SAFETY FEATURES

2.3.2.1 Reactor Building Spray System

System Description

The reactor building spray system along with reactor building cooling system is designed to remove heat from the containment atmosphere after a design basis event by delivering borated water through spray nozzles in upper containment. The system also removes the fission product iodine from the post accident containment atmosphere.

System Intended Functions

Portions of the reactor building spray system are relied upon to maintain containment integrity. Portions of the reactor building spray system are relied upon to remain functional during and following design basis events to reduce inventory of fission products from the containment atmosphere and provide containment pressure and temperature reduction. Therefore, the reactor building spray system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the reactor building spray system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the reactor building spray system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the reactor building spray system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the reactor building spray system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and EQ (10 CFR 50.49). Therefore, the reactor building spray system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the reactor building spray system can be found in the UFSAR Sections 1.2.2.4, 6.1.1, 6.2.1.1.2, and Figure 6-2.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

ONS flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the reactor building spray system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-103A-1.1
- OSLRD-103A-2.1
- OSLRD-103A-3.1

Secondary Drawings

- OSLRD-102A-1.1
- OSLRD-102A-2.1
- OSLRD-102A-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.2-1, Reactor Building Spray System.

Table 2.3.2-1 Reactor Building Spray System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Expansion Joint	Pressure Boundary
Flexible Connection	Structural Integrity
Flow Element	Flow Restriction Pressure Boundary

Table 2.3.2-1 Reactor Building Spray System

Component/Commodity Group	Intended Functions
Insulation	Thermal Resistance
Orifice	Flow Restriction Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Pump Casing (reactor building spray)	Pressure Boundary
Sight Glass	Structural Integrity
Spray Nozzle	Spray Pattern
Valve Body	Pressure Boundary

The AMR results for these component types are indicated in Table 3.2.2-1, Engineering Safety Features – Reactor Building Spray System- Aging Management Evaluation.

2.3.2.2 Core Flood System

System Description

The core flood system acts as a portion of the overall emergency core cooling system with the high pressure injection system and the low pressure injection system. The core flood system is designed to inject water directly into the reactor vessel when the reactor coolant system pressure drops below a certain level following an accident. The core flood system is self contained, self actuating, and passive in nature. The driving force to inject the stored borated water into the reactor vessel is supplied by a pressurized nitrogen cover in the core flood tanks. After an accident, when the reactor coolant system pressure decreases below the nitrogen cover pressure, the contents of the core flood tanks will be injected directly into the reactor vessel.

System Intended Functions

Portions of the core flood system are relied upon to maintain containment integrity and reactor coolant pressure boundary integrity. Portions of the core flood system are relied upon to remain functional during and following design basis events to inject borated water into the reactor coolant system. Therefore, the core flood system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the core flood system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the core flood system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the core flood system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the core flood system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and EQ (10 CFR 50.49). Therefore, the core flood system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the core flood system can be found in the UFSAR Sections 1.2.2.4, 3.6.1.2.1, 5.4.7.3, 6.3.2.2.3, 6.3.3.2, Table 6-10, and Figure 6-1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

ONS flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the core flood system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-102A-1.3
- OSLRD-102A-2.3
- OSLRD-102A-3.3

Secondary Drawings

- OSLRD-110A-1.1
- OSLRD-110A-2.1
- OSLRD-110A-3.1
- OSLRD-127B-1.2
- OSLRD-127B-2.2
- OSLRD-127B-3.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.2-2, Core Flood System.

Table 2.3.2-2 Core Flood System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Flexible Connection	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Tank (core flood)	Pressure Boundary
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.2.2-2, Engineering Safety Features – Core Flood System - Aging Management Evaluation.

2.3.2.3 High Pressure Injection System

System Description

The high pressure injection system acts as a portion of the overall emergency core cooling system with the low pressure injection system and the core flood system. This system is comprised of the high pressure injection system and the standby shutdown reactor coolant makeup system. The high pressure injection system operates during normal reactor operation to recirculate reactor coolant for purification and boric acid concentration control and to supply seal water to the reactor coolant pumps. Letdown flow is directed to the letdown storage tank, which provides suction flow to the operating high pressure injection pump. The letdown storage tank is normally supplied with a hydrogen overpressure. The high pressure injection pump supplies water directly to the reactor coolant system and also supplies seal injection water to the reactor coolant pumps.

During emergency operation, the high pressure injection system automatically injects borated water into the reactor vessel through the reactor coolant system cold legs and reactor coolant pump seals, on low reactor coolant pressure or high reactor building pressure. The water added directly to the system makes up for water lost due to a primary side leak or from shrinkage of the reactor coolant system due to cooling caused by a secondary side break.

During an event when normal makeup system becomes inoperable, the standby shutdown facility reactor coolant makeup system is designed to supply borated water to the reactor coolant system to provide reactor coolant pump seal cooling and reactor coolant system inventory for all three units simultaneously. The standby shutdown facility reactor coolant makeup system is capable of delivering borated water from the spent fuel pool to the reactor coolant pump seal injection lines. A portion of this seal injection flow is used to makeup for reactor coolant pump seal leakage while the remainder flows into the reactor coolant system to makeup for other reactor coolant system leakage.

System Intended Functions

Portions of the high pressure injection system are relied upon to maintain containment and reactor coolant pressure boundary integrity. Portions of the high pressure injection system inject borated water into the reactor coolant pump seals and the reactor coolant system during postulated design basis events. Portions of the high pressure injection system also provide a flow path from the letdown storage tank to the reactor building emergency sump for LOCA mitigation. The standby shutdown facility reactor coolant makeup system supplies makeup water from the spent fuel pool to the reactor coolant system for inventory control and supplies cooling water from the spent fuel pool to the reactor coolant pump seals to prevent seal LOCA. The standby shutdown facility reactor coolant makeup system also provides a flow path to letdown the reactor coolant system into the spent fuel pool. Therefore, the high pressure injection system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the high pressure injection system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the high pressure injection system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the high pressure injection system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the high pressure injection system are relied upon for compliance with regulations for fire protection (10 CFR 50.48), SBO (10 CFR 50.63) and EQ (10 CFR 50.49). Therefore, the high pressure injection system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the high pressure injection system can be found in the UFSAR Sections 1.2.2.4, 3.2.2.1, 5.4.7.2, 6.1.1, 6.3.2.2.1, 6.3.3.1, Table 6-8, and Figure 6-1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

ONS flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the high pressure injection system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-101A-1.1
- OSLRD-101A-1.2
- OSLRD-101A-1.3
- OSLRD-101A-1.4
- OSLRD-101A-1.5
- OSLRD-101A-2.1
- OSLRD-101A-2.2
- OSLRD-101A-2.3
- OSLRD-101A-2.4
- OSLRD-101A-2.5
- OSLRD-101A-3.1
- OSLRD-101A-3.2
- OSLRD-101A-3.3
- OSLRD-101A-3.4
- OSLRD-101A-3.5
- OSLRD-109A-1.1
- OSLRD-109A-3.1

Secondary Drawings

- OSLRD-100A-1.3
- OSLRD-100A-2.3
- OSLRD-100A-3.3
- OSLRD-110A-1.1
- OSLRD-110A-2.1
- OSLRD-110A-3.1
- OSLRD-124B-1.1
- OSLRD-124B-2.1
- OSLRD-124B-3.1
- OSLRD-125A-1.4
- OSLRD-125A-2.3
- OSLRD-125A-3.4
- OSLRD-127B-2.2
- OSLRD-127B-3.2
- OSLRD-144A-1.2
- OSLRD-144A-2.2
- OSLRD-144A-3.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.2-3, High Pressure Injection System.

Table 2.3.2-3 High Pressure Injection System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Expansion Joint	Pressure Boundary
Filter Body	Pressure Boundary Structural Integrity
Flexible Connection	Pressure Boundary Structural Integrity
Flow Element	Flow Restriction Pressure Boundary Structural Integrity
Heat Exchanger (letdown cooler) Head	Structural Integrity

Table 2.3.2-3 High Pressure Injection System

Component/Commodity Group	Intended Functions
Heat Exchanger (letdown cooler) Shell	Structural Integrity
Heat Exchanger (reactor coolant seal return cooler) Head	Structural Integrity
Heat Exchanger (reactor coolant seal return cooler) Shell	Structural Integrity
Insulation	Thermal Resistance
Orifice	Flow Restriction Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Pulsation Dampener	Pressure Boundary
Pump Casing (high pressure injection)	Pressure Boundary
Pump Casing (standby shutdown facility reactor coolant makeup)	Pressure Boundary
Sight Glass	Structural Integrity
Strainer Body	Pressure Boundary
Strainer Screen	Filtration
Tank (letdown storage)	Pressure Boundary
Tank (purification demineralizer)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.2.2-3, Engineering Safety Features – High Pressure Injection System - Aging Management Evaluation.

2.3.2.4 Low Pressure Injection System

System Description

The low pressure injection system acts as a portion of the overall emergency core cooling system with the high pressure injection system and the core flood system. The low pressure injection system is used during hot shutdown, cold shutdown, and refueling operations to remove decay heat. During power operation, the system is idle.

During unit cooldown, the reactor coolant temperature and pressure are reduced via the steam generators. At approximately 250°F and 300 psig, the low pressure injection system is placed in service. Reactor coolant is drawn from the reactor coolant system via the decay heat drop line and cooled by the decay heat removal coolers and returned to the reactor coolant system.

Upon initiation of an accident, the low pressure injection system takes suction from the borated water storage tank and injects the tank contents into the reactor vessel. When the borated water storage tank level becomes low, system suction is manually transferred to the reactor building emergency sump. Water from the sump is cooled by the decay heat removal coolers and injected back into the reactor vessel.

System Intended Functions

Portions of the low pressure injection system are relied upon to maintain containment and reactor coolant system integrity. Portions of the low pressure injection system inject borated water into the reactor vessel during and following design basis events while rejecting decay heat to the low pressure service water system. Portions of the low pressure injection system also circulate the reactor coolant system to prevent boron precipitation post LOCA. Portions of the low pressure injection system also provide borated water to the high pressure injection and reactor building spray pumps during design basis events. The low pressure injection system also provides reactor coolant system pressure control following a steam generator tube rupture event.Therefore, the low pressure injection system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the low pressure injection system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the low pressure injection system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the low pressure injection system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the low pressure injection system are relied upon for compliance with regulations for fire protection (10 CFR 50.48), SBO (10 CFR 50.63) and EQ (10 CFR 50.49). Therefore, the low pressure injection system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the low pressure injection system can be found in the UFSAR Sections 1.2.2.4, 3.2.2.1, 3.6.1.2.1, 5.4.7.1, 6.1.1, 6.3.1, 6.3.2.2.2, 6.3.2.5, 6.3.3.2, Table 6-9, and Figure 6-1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

ONS flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the low pressure injection system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-102A-1.1
- OSLRD-102A-1.2
- OSLRD-102A-1.3
- OSLRD-102A-2.1
- OSLRD-102A-2.2
- OSLRD-102A-2.3
- OSLRD-102A-3.1
- OSLRD-102A-3.2
- OSLRD-102A-3.3

Secondary Drawings

- OSLRD-101A-1.3
- OSLRD-101A-2.3
- OSLRD-101A-3.3
- OSLRD-102A-1.3
- OSLRD-102A-2.3
- OSLRD-102A-3.3
- OSLRD-104A-1.2
- OSLRD-104A-3.2
- OSLRD-106A-1.2
- OSLRD-106A-2.2
- OSLRD-106A-3.2
- OSLRD-107D-1.2
- OSLRD-107D-2.2
- OSLRD-107D-3.2
- OSLRD-110A-1.1
- OSLRD-110A-1.4
- OSLRD-110A-2.1
- OSLRD-110A-2.4
- OSLRD-110A-3.1
- OSLRD-110A-3.4
- OSLRD-124B-1.1
- OSLRD-124B-2.1
- OSLRD-124B-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.2-4, Low Pressure Injection System.

Table 2.3.2-4 Low Pressure Injection System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Emergency Sump Strainer (decay heat removal)	Filtration
Flexible Connection	Pressure Boundary Structural Integrity
Flow Element	Flow Restriction Pressure Boundary

Table 2.3.2-4 Low Pressure Injection System

Component/Commodity Group	Intended Functions
Heat Exchanger (decay heat removal cooler) Head	Pressure Boundary
Heat Exchanger (decay heat removal cooler) Shell	Pressure Boundary
Heat Exchanger (decay heat removal cooler) Tubesheet	Pressure Boundary
Heat Exchanger (decay heat removal) Tubes	Pressure Boundary Heat Transfer
Insulation	Thermal Resistance
Orifice	Flow Restriction Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Pump Casing (decay heat removal)	Pressure Boundary
Sight Glass	Structural Integrity
Strainer Body	Pressure Boundary
Strainer Screen	Filtration
Tank (borated water storage)	Pressure Boundary
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.2.2-4, Engineering Safety Features – Low Pressure Injection System - Aging Management Evaluation.

2.3.3 AUXILIARY SYSTEMS

2.3.3.1 Air Gas Related Systems

2.3.3.1.1 Auxiliary Instrument Air System

System Description

The auxiliary instrument air system provides a reliable source of instrument air to selected components in order to minimize operator burden during a loss of instrument air while reaching and maintaining a safe shutdown.

System Intended Functions

Portions of the auxiliary instrument air system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the auxiliary instrument air system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the auxiliary instrument air system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

Additional details of the auxiliary instrument air system can be found in UFSAR Section 9.5.2.2.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the auxiliary instrument air system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-137F-1.1
- OSLRD-137F-2.1
- OSLRD-137F-3.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.1-1, Auxiliary Instrument Air System.

Table 2.3.3.1-1 Auxiliary Instrument Air System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Piping	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-1, Auxiliary Systems - Auxiliary Instrument Air System - Aging Management Evaluation.

2.3.3.1.2 Breathing Air System

System Description

The breathing air system provides a source of breathing air for plant personnel in support of maintenance and operations activities. Breathing air is supplied to all areas and elevations by headers and individual supply stations where the pressure is regulated for personnel use. Units 1 and 2 have one primary and one backup compressor package total for both Units, and Unit 3 has one primary and one backup compressor package. The breathing air systems are cross connected in such a way that any of the compressors can supply either of the Units' breathing air needs.

System Intended Functions

Portions of the breathing air system are relied upon to maintain containment integrity. Therefore, the breathing air system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the breathing air system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the breathing air system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the breathing air system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

Additional details of the breathing air system can be found in UFSAR Section 9.5.2.2.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the breathing air system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-137A-1.1
- OSLRD-137A-1.2
- OSLRD-137A-1.3
- OSLRD-137A-1.4
- OSLRD-137A-1.5

- OSLRD-137A-2.2
- OSLRD-137A-2.3
- OSLRD-137A-2.4
- OSLRD-137A-3.1
- OSLRD-137A-3.2
- OSLRD-137A-3.3
- OSLRD-137A-3.4

Secondary Drawings

- OSLRD-124C-2.7

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.1-2, Breathing Air System.

Table 2.3.3.1-2 Breathing Air System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity
Sight Glass	Structural Integrity
Tank (breathing air receiver)	Structural Integrity
Trap Body	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-2, Auxiliary Systems - Breathing Air System - Aging Management Evaluation.

2.3.3.1.3 Hydrogen System

System Description

The hydrogen system uses hydrogen gas to pressurize the high pressure injection letdown storage tanks to maintain the dissolved hydrogen concentration in the reactor coolant system within acceptable limits to inhibit corrosion caused by dissolved oxygen gas. The hydrogen system also provides hydrogen gas to the main generator of each unit. The portion of the hydrogen supply piping connecting to the letdown storage tanks is within the boundary of the high pressure injection system.

System Intended Functions

Portions of the hydrogen system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the hydrogen system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the hydrogen system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the hydrogen system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the hydrogen system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-127A-1.1
- OSLRD-127A-1.2
- OSLRD-127A-2.2
- OSLRD-127A-3.2

Secondary Drawings

- OSLRD-121A-1.4
- OSLRD-121A-2.4
- OSLRD-121A-3.4

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.1-3, Hydrogen System.

Table 2.3.3.1-3 Hydrogen System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Heat Exchanger (hydrogen cooler) Water Box	Structural Integrity
Piping	Structural Integrity
Sight Glass	Structural Integrity
Trap Body	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-3, Auxiliary Systems - Hydrogen System - Aging Management Evaluation.

2.3.3.1.4 Instrument Air System

System Description

The instrument air system provides a reliable source of clean, dry, oil free compressed air at the proper pressure to air-operated valves, instruments, and other components connected to the instrument air system. The instrument air system is shared between all three Oconee units.

The Unit 1, Unit 2, and Unit 3 startup and main feedwater control valves are supplied with backup compressed air from accumulator tanks.

System Intended Functions

Portions of the instrument air system are relied upon to maintain containment integrity. Portions of the instrument air system provide feedwater isolation during a main steam line break design basis event. Therefore, the instrument air system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the instrument air system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the instrument air system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the instrument air system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the instrument air system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the instrument air system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the instrument air system can be found in UFSAR Section 9.5.2.2.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the instrument air system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-137B-1.1
- OSLRD-137B-1.2
- OSLRD-137B-1.3
- OSLRD-137B-1.4

- OSLRD-137B-2.4
- OSLRD-137B-3.4

Secondary Drawings

- OSLRD-121A-2.5
- OSLRD-124A-1.2
- OSLRD-124B-1.1
- OSLRD-124B-2.1
- OSLRD-124B-3.1
- OSLRD-124C-2.7
- OSLRD-125A-1.5
- OSLRD-137C-1.3
- OSLRD-137F-1.1
- OSLRD-137F-2.1
- OSLRD-137F-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.1-4, Instrument Air System.

Table 2.3.3.1-4 Instrument Air System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Dryer Casing (primary)	Pressure Boundary
Dryer Casing (secondary desiccant)	Pressure Boundary
Filter Housing (primary desiccant)	Pressure Boundary
Filter Housing (primary)	Pressure Boundary
Filter Housing (secondary desiccant dryer afterfilter)	Pressure Boundary
Filter Housing (secondary desiccant dryer prefilter)	Pressure Boundary
Flexible Connection	Structural Integrity

Table 2.3.3.1-4 Instrument Air System

Component/Commodity Group	Intended Functions
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Sight Glass	Structural Integrity
Silencer	Pressure Boundary
Tank (aftercooler drain accumulator)	Structural Integrity
Tank (auxiliary building instrument air receiver)	Pressure Boundary
Tank (backup instrument air receiver)	Pressure Boundary
Tank (evacuation air horn instrument air)	Pressure Boundary
Tank (feedwater control valve accumulator)	Pressure Boundary
Trap Body	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-4, Auxiliary Systems - Instrument Air System - Aging Management Evaluation.

2.3.3.1.5 Keowee Air Breaker System

System Description

The Keowee air breaker system maintains design pressure on the Keowee air breaker system reservoirs which contain a supply of air for the operation of the air circuit breakers. The air circuit breakers provide the electrical connection for the Keowee units to provide emergency power to the ONS units.

System Intended Functions

Portions of the Keowee air breaker system are relied upon to ensure sufficient pressure and volume of compressed air in the Keowee air breaker system reservoirs to cycle (open/close) the air circuit breakers following a loss of offsite power in conjunction with a design basis event. Therefore, the Keowee air breaker system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the Keowee air breaker system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Non-safety related components in the Keowee air breaker system are periodically relied upon to make up air to the reservoirs to compensate for system losses. Portions of the Keowee air breaker system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related piping components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee air breaker system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the Keowee air breaker system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the Keowee air breaker system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the Keowee air breaker system can be found in UFSAR Section 8.3.1.1.1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee air breaker system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- KSLRD-107A-1.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.1-5, Keowee Air Breaker System.

Table 2.3.3.1-5 Keowee Air Breaker System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary
Filter Body	Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Tank (air breaker reservoir)	Pressure Boundary
Tank (air compressor)	Pressure Boundary
Valve Body	Pressure Boundary

The AMR results for these component types are indicated in Table 3.3.2-5, Auxiliary Systems - Keowee Air Breaker System - Aging Management Evaluation.

2.3.3.1.6 Keowee Depressing Air System

System Description

The Keowee depressing air system supplies controlled air to the Keowee turbine generator solenoid-operated cooling water control valves and serves as a backup for the Keowee station air system.

System Intended Functions

Portions of the Keowee depressing air system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee depressing air system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee depressing air system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the Keowee depressing air system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee depressing air system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- KSLRD-111A-1.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.1-6, Keowee Depressing Air System.

Table 2.3.3.1-6 Keowee Depressing Air System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Piping	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-6, Auxiliary Systems - Keowee Depressing Air System - Aging Management Evaluation.

2.3.3.1.7 Keowee Governor Air System

System Description

The Keowee governor air system maintains a cover pressure in the governor oil pressure tank. Following a loss of offsite power in conjunction with a design basis event requiring Keowee to supply emergency power, the Keowee governor air system maintains a pressure boundary to retain an adequate blanket of pressurized air in the governor oil pressure tank. The Keowee governor oil system depends on the air cushion to provide sufficient governor oil pressure to control the Keowee turbine.

System Intended Functions

Portions of the Keowee governor air system are relied upon to provide a blanket of pressurized air in the governor oil pressure tank to enable Keowee hydro station to start. Therefore, the Keowee governor air system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the Keowee governor air system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee governor air system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee governor air system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the Keowee governor air system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the Keowee governor air system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

No additional details of the Keowee governor air system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee governor air system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- KSLRD-104A-1.1
- KSLRD-104A-2.1

Secondary Drawings

- KSLRD-109A-1.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.1-7, Keowee Governor Air System.

Table 2.3.3.1-7 Keowee Governor Air System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Heat Exchanger (air compressor aftercooler) Shell	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Tank (air receiver)	Pressure Boundary
Trap Body	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-7, Auxiliary Systems - Keowee Governor Air System - Aging Management Evaluation.

2.3.3.1.8 Keowee Station Air System

System Description

The Keowee station air system provides compressed air to various Keowee hydro station components including an air warning horn and the Keowee main generator air brakes. In addition, the Keowee station air system supplies compressed air to the Keowee instrument air system and the Keowee depressing air system.

System Intended Functions

Portions of the Keowee station air system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee station air system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee station air system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the Keowee station air system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee station air system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- KSLRD-110A-1.1

Secondary Drawings

- KSLRD-109A-1.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.1-8, Keowee Station Air System.

Table 2.3.3.1-8 Keowee Station Air System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Heat Exchanger (air compressor aftercooler) Shell	Structural Integrity
Piping	Structural Integrity
Strainer Body	Structural Integrity
Trap Body	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-8, Auxiliary Systems - Keowee Station Air System - Aging Management Evaluation.

2.3.3.1.9 Nitrogen Purge and Blanket System

System Description

The nitrogen purge and blanket system vaporizes liquified nitrogen from a storage tank in the yard to supply high and low-pressure headers which distribute nitrogen in the plant. The high-pressure header supplies the pressurizer and the core flood tanks inside the reactor building. The low-pressure header supplies the steam generators (primary and secondary sides), pressurizer, quench tank, and various components outside the reactor building. Bottled nitrogen is provided to the emergency feedwater steam generator level control valves and the turbine driven emergency feedwater pump steam admission valve.

System Intended Functions

Portions of the nitrogen purge and blanket system are relied upon to maintain containment integrity. Portions of the nitrogen purge and blanket system isolate steam supply to turbine-driven main feedwater pump to prevent feedwater flow to the steam generators on an automatic feedwater isolation signal and to ensure capability to throttle or close emergency feedwater level control valves to regulate feedwater flow to the steam generators. Therefore, the nitrogen purge and blanket system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(1).

Portions of the nitrogen purge and blanket system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the nitrogen purge and blanket system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the nitrogen purge and blanket system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the nitrogen purge and blanket system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the nitrogen purge and blanket system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the nitrogen purge and blanket system can be found in UFSAR Sections 6.3.2.2.3 and 7.4.3.1.2.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the nitrogen purge and blanket system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-127B-1.1
- OSLRD-127B-1.2

- OSLRD-127B-2.1
- OSLRD-127B-2.2
- OSLRD-127B-3.1
- OSLRD-127B-3.2
- OSLRD-127C-1.1
- OSLRD-127C-1.2
- OSLRD-127C-2.1
- OSLRD-127C-2.2
- OSLRD-127C-3.1
- OSLRD-127C-3.2
- OSLRD-127D-1.1

Secondary Drawings

- OSLRD-110A-1.3
- OSLRD-110A-2.3
- OSLRD-110A-3.3
- OSLRD-121B-1.5
- OSLRD-121B-2.5
- OSLRD-121B-3.5

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.1-9, Nitrogen Purge and Blanket System.

Table 2.3.3.1-9 Nitrogen Purge and Blanket System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Filter Body	Pressure Boundary
Flexible Connection	Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Tank (low pressure nitrogen heater)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-9, Auxiliary Systems - Nitrogen Purge and Blanket System - Aging Management Evaluation.

2.3.3.1.10 Service Air System

System Description

The service air system provides compressed air throughout the plant for use with portable air-powered equipment. The service air system acts as a backup compressed air supply for the instrument air system. If the instrument air header pressure decreases to below the setpoint, the service air system automatically supplies compressed air to the instrument air header.

System Intended Functions

Portions of the service air system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the service air system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the service air system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the service air system are relied upon for compliance with regulations for SBO (10 CFR 50.63). Therefore, the service air system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the service air system can be found in UFSAR Section 10.4.7.2.7.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the service air system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-137C-1.1
- OSLRD-137C-1.2
- OSLRD-137C-1.4

Secondary Drawings

- OSLRD-125A-3.5

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.1-10, Service Air System.

Table 2.3.3.1-10 Service Air System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Filter Body	Pressure Boundary
Heat Exchanger (portable diesel compressor aftercooler) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (temporary diesel compressor aftercooler) Tubes	Heat Transfer Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Sight Glass	Structural Integrity
Strainer Body	Structural Integrity
Tank (portable diesel compressor oil separator)	Pressure Boundary

Table 2.3.3.1-10 Service Air System

Component/Commodity Group	Intended Functions
Tank (service air compressor separator)	Structural Integrity
Tank (service air receiver)	Pressure Boundary
Tank (temporary diesel compressor oil separator)	Pressure Boundary
Trap Body	Pressure Boundary Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-10, Auxiliary Systems - Service Air System - Aging Management Evaluation.

2.3.3.1.11 Standby Shutdown Facility Fire Protection System

System Description

The standby shutdown facility contains two fire protection systems, a water system and a carbon dioxide system. The water system is evaluated with the high pressure service water system. The carbon dioxide system is evaluated with the standby shutdown facility fire protection system.

The standby shutdown facility diesel generator room is equipped with a carbon dioxide fire suppression system. The carbon dioxide system is actuated by thermal detectors to automatically flood the standby shutdown facility diesel area. Carbon dioxide is stored in a refrigerated storage tank in sufficient quantity to provide twice the required coverage for the area.

System Intended Functions

Portions of the standby shutdown facility fire protection system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) regulations. Therefore, the standby shutdown facility fire protection system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the standby shutdown facility fire protection system can be found in UFSAR Section 9.6.3.6.2.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the standby shutdown facility fire protection system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-138B-1.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.1-11, Standby Shutdown Facility Fire Protection System.

Table 2.3.3.1-11 Standby Shutdown Facility Fire Protection System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary
Heat Exchanger (carbon dioxide evaporator/condenser) Tubes	Heat Transfer Pressure Boundary
Nozzle	Spray Pattern

Table 2.3.3.1-11 Standby Shutdown Facility Fire Protection System

Component/Commodity Group	Intended Functions
Piping	Pressure Boundary
Tank (carbon dioxide storage)	Pressure Boundary
Valve Body	Pressure Boundary

The AMR results for these component types are indicated in Table 3.3.2-11, Auxiliary Systems - Standby Shutdown Facility Fire Protection System - Aging Management Evaluation.

2.3.3.2 Ancillary Related Systems

2.3.3.2.1 Chemical Addition System

System Description

The chemical addition system is designed to mix, store, and inject chemicals into the reactor coolant system and auxiliary systems. The system also functions as a central location for sampling various fluids throughout the plant to ensure chemical concentrations are maintained within the prescribed limits. Following a LOCA, trisodium phosphate stored in the reactor building basement is dissolved during reactor building flooding to maintain the pH of the water for post accident iodine removal and retention. The post accident sampling system is evaluated within the chemical addition system.

System Intended Functions

Portions of the chemical addition system are relied upon to maintain containment and reactor coolant pressure boundary integrity. Portions of the chemical addition system provide pH adjustment to the water within the reactor building emergency sump following a design basis event. Therefore, the chemical addition system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the chemical addition system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the chemical addition system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the chemical addition system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

Additional details of the chemical addition system can be found in UFSAR Sections 5.1.1.4.6, 5.1.1.4.7, 5.4.7.5, 9.3.1, and 10.4.8.2, and Figures 9-15 and 9-16, and Table 9-5.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the chemical addition system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-110A-1.1
- OSLRD-110A-1.2
- OSLRD-110A-1.3
- OSLRD-110A-1.4
- OSLRD-110A-1.5
- OSLRD-110A-1.6
- OSLRD-110A-1.7
- OSLRD-110A-1.8
- OSLRD-110A-1.11
- OSLRD-110A-1.12
- OSLRD-110A-1.13
- OSLRD-110A-2.1
- OSLRD-110A-2.2
- OSLRD-110A-2.4
- OSLRD-110A-2.5
- OSLRD-110A-2.11
- OSLRD-110A-2.12
- OSLRD-110A-3.1
- OSLRD-110A-3.2
- OSLRD-110A-3.3
- OSLRD-110A-3.4
- OSLRD-110A-3.5
- OSLRD-110A-3.6
- OSLRD-110A-3.7
- OSLRD-110A-3.8
- OSLRD-110A-3.11
- OSLRD-110A-3.12

Secondary Drawings

- OSLRD-102A-1.1
- OSLRD-102A-2.1
- OSLRD-102A-3.1

- OSLRD-106A-1.2
- OSLRD-106A-2.2
- OSLRD-106A-3.2
- OSLRD-106B-1.2
- OSLRD-106E-1.2
- OSLRD-107E-1.1
- OSLRD-107E-1.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.2-1, Chemical Addition System.

Table 2.3.3.2-1 Chemical Addition System

Component/Commodity Group	Intended Functions
Accumulator	Structural Integrity
Bolting	Pressure Boundary Structural Integrity
Burette	Structural Integrity
Flexible Connection	Pressure Boundary Structural Integrity
Flow Element	Flow Restriction Pressure Boundary
Heat Exchanger (pressurizer sample cooler) Coil	Structural Integrity
Moisture Separator	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Pump Casing (caustic addition)	Structural Integrity
Pump Casing (high pressure boric acid)	Structural Integrity

Table 2.3.3.2-1 Chemical Addition System

Component/Commodity Group	Intended Functions
Pump Casing (hydrazine addition primary)	Structural Integrity
Pump Casing (hydrazine addition secondary)	Structural Integrity
Pump Casing (lithium hydroxide addition)	Structural Integrity
Pump Casing (low pressure boric acid)	Structural Integrity
Pump Casing (normal and standby chemical addition)	Structural Integrity
Pump Casing (pressurizer chemical addition)	Structural Integrity
Pump Casing (secondary side amine addition)	Structural Integrity
Pump Casing (total dissolved gas sampling)	Structural Integrity
Pump Casing (zinc addition)	Structural Integrity
Sample Bomb	Structural Integrity
Sight Glass	Structural Integrity
Strainer Body	Structural Integrity
Tank (boric acid mixing)	Structural Integrity
Tank (cation exchange column)	Structural Integrity
Tank (caustic mixing)	Structural Integrity
Tank (gas collection container)	Structural Integrity
Tank (hydrazine drum)	Structural Integrity
Tank (hydrazine)	Structural Integrity

Table 2.3.3.2-1 Chemical Addition System

Component/Commodity Group	Intended Functions
Tank (lithium hydroxide mix)	Structural Integrity
Tank (zinc addition fill)	Structural Integrity
Trap Body	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR for these component types are indicated in Table 3.3.2-12, Auxiliary Systems - Chemical Addition System - Aging Management Evaluation.

2.3.3.2.2 Coolant Storage System

System Description

The coolant storage system is designed to accommodate the accumulated coolant bleed over a core cycle, including startup expansion and coolant letdown to storage for boric acid reduction.

System Intended Functions

Portions of the coolant storage system are relied upon for containment integrity. Therefore, the coolant storage system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the coolant storage system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the coolant storage system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the coolant storage system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the coolant storage system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and EQ (10 CFR 50.49) regulations. Therefore, the coolant storage system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the coolant storage system can be found in UFSAR Sections 6.3.2.3.5 and 9.3.4, and Figure 9-20, and Table 9-10.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the coolant storage system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-107A-1.1
- OSLRD-107A-1.2
- OSLRD-107A-2.1
- OSLRD-107A-2.2
- OSLRD-107A-3.1
- OSLRD-107A-3.2
- OSLRD-109A-1.2
- OSLRD-109A-3.2

Secondary Drawings

- OSLRD-100A-1.2
- OSLRD-100A-2.2
- OSLRD-100A-3.2
- OSLRD-102A-2.3
- OSLRD-102A-3.3
- OSLRD-104A-1.1
- OSLRD-104A-3.1
- OSLRD-106A-1.1
- OSLRD-106A-1.2
- OSLRD-106A-2.1
- OSLRD-106A-2.2
- OSLRD-106A-3.1
- OSLRD-106A-3.2

- OSLRD-109A-1.1
- OSLRD-109A-3.1
- OSLRD-110A-1.2
- OSLRD-110A-2.2
- OSLRD-110A-3.2
- OSLRD-127B-1.2
- OSLRD-127B-2.2
- OSLRD-127B-3.2
- OSLRD-144A-1.2
- OSLRD-144A-2.2
- OSLRD-144A-3.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.2-2, Coolant Storage System.

Table 2.3.3.2-2 Coolant Storage System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Flexible Connection	Structural Integrity
Flow Element	Flow Restriction Pressure Boundary Structural Integrity
Heat Exchanger (quench tank cooler) Head	Structural Integrity
Heat Exchanger (quench tank cooler) Shell	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Pump Casing (component drain)	Structural Integrity
Pump Casing (concentrated boric acid tank)	Structural Integrity

Table 2.3.3.2-2 Coolant Storage System

Component/Commodity Group	Intended Functions
Pump Casing (quench tank drain)	Structural Integrity
Pump Casing (reactor coolant bleed transfer A, B)	Pressure Boundary
Sight Glass	Structural Integrity
Strainer Body	Structural Integrity
Tank (‘A’ reactor coolant bleed holdup)	Pressure Boundary
Tank (‘B’ reactor coolant bleed holdup)	Structural Integrity
Tank (concentrated boric acid)	Structural Integrity
Tank (deborating demineralizer)	Structural Integrity
Tank (quench)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR for these component types are indicated in Table 3.3.2-13, Auxiliary Systems - Coolant Storage System - Aging Management Evaluation.

2.3.3.2.3 Coolant Treatment System

System Description

The coolant treatment system stores reactor coolant bleed. The coolant treatment header also facilitates the processing of liquid waste from the liquid waste disposal system.

System Intended Functions

Portions of the coolant treatment system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the coolant treatment system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the coolant treatment system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

Additional details of the coolant treatment system can be found in UFSAR Sections 9.3.5 and 11.2.2.1, and Figure 9-21.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the coolant treatment system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-106B-1.4
- OSLRD-106B-1.5

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.2-3, Coolant Treatment System.

Table 2.3.3.2-3 Coolant Treatment System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Piping	Structural Integrity
Pump Casing (condensate test)	Structural Integrity
Tank (condensate test)	Structural Integrity
Valve Body	Structural Integrity

The AMR for these component types are indicated in Table 3.3.2-14, Auxiliary Systems - Coolant Treatment System - Aging Management Evaluation.

2.3.3.2.4 Demineralized Water System

System Description

The purpose of the demineralized water system is to supply demineralized water to the plant for use in water systems and hose stations.

System Intended Functions

Portions of the demineralized water system are relied upon to maintain containment integrity. Therefore, the demineralized water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the demineralized water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the demineralized water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the demineralized water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the demineralized water system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the demineralized water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-106E-1.1
- OSLRD-106E-1.2
- OSLRD-106E-1.3
- OSLRD-106E-2.1
- OSLRD-106E-3.1

Secondary Drawings

- OSLRD-102A-1.1
- OSLRD-102A-2.1
- OSLRD-102A-3.1
- OSLRD-104A-1.2
- OSLRD-104A-1.3
- OSLRD-104A-3.1
- OSLRD-106B-1.5
- OSLRD-107A-1.1
- OSLRD-107A-2.1
- OSLRD-107A-3.1

- OSLRD-107B-1.2
- OSLRD-107B-1.3
- OSLRD-107B-2.2
- OSLRD-107B-3.2
- OSLRD-107B-3.3
- OSLRD-107C-1.1
- OSLRD-107C-3.1
- OSLRD-107D-1.1
- OSLRD-107D-3.1
- OSLRD-107E-1.2
- OSLRD-107F-1.1
- OSLRD-107F-3.1
- OSLRD-107M-1.1
- OSLRD-107M-1.2
- OSLRD-108A-1.1
- OSLRD-108A-1.2
- OSLRD-108A-3.1
- OSLRD-108A-3.2
- OSLRD-110A-1.1
- OSLRD-110A-1.2
- OSLRD-110A-1.3
- OSLRD-110A-1.7
- OSLRD-110A-1.12
- OSLRD-110A-1.13
- OSLRD-110A-2.1
- OSLRD-110A-3.1
- OSLRD-110A-3.2
- OSLRD-110A-3.3
- OSLRD-116H-1.1
- OSLRD-122C-1.4
- OSLRD-122C-2.4
- OSLRD-122C-3.4
- OSLRD-144A-1.1
- OSLRD-144A-2.1
- OSLRD-144A-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.2-4, Demineralized Water System.

Table 2.3.3.2-4 Demineralized Water System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity

Table 2.3.3.2-4 Demineralized Water System

Component/Commodity Group	Intended Functions
Expansion Joint	Structural Integrity
Flow Element	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR for these component types are indicated in Table 3.3.2-15, Auxiliary Systems - Demineralized Water System - Aging Management Evaluation.

2.3.3.2.5 Essential Siphon Vacuum System

System Description

The essential siphon vacuum system supports the condenser circulating water system by removing air from the condenser circulating water intake header during normal and siphon modes of operation. In the event condenser circulating water pumps are not available, a siphon is required to convey water from Lake Keowee through the condenser circulating water pumps and lines in order to supply water for the low pressure service water pumps. During normal operation, the essential siphon vacuum system removes air from the condenser circulating water intake headers to ensure that the operable intake headers are primed at the start of an event requiring the siphon mode of operation. During siphon mode of operation, the essential siphon vacuum system also removes air from the condenser circulating water intake headers to ensure that the siphon does not fail due to air accumulation during a design basis event involving loss of power to the condenser circulating water pumps.

System Intended Functions

Portions of the essential siphon vacuum system are relied upon to remove air from the essential siphon vacuum siphon headers. Therefore, the essential siphon vacuum system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the essential siphon vacuum system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the essential siphon vacuum system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the essential siphon vacuum system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

Additional details of the essential siphon vacuum system can be found in UFSAR Sections 7.5.2.59, 7.5.2.60, 7.5.2.61, 9.2.2.1, 9.2.2.2.2, and 9.2.2.2.5, and Figure 9-42.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the essential siphon vacuum system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-130A-1.1
- OSLRD-130A-2.1
- OSLRD-130A-3.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.2-5, Essential Siphon Vacuum System.

Table 2.3.3.2-5 Essential Siphon Vacuum System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity
Pump Casing (essential siphon vacuum)	Pressure Boundary
Separator (essential siphon vacuum pump air-water)	Pressure Boundary
Sight Glass	Pressure Boundary
Silencer	Structural Integrity
Tank (essential siphon vacuum receiver)	Pressure Boundary
Valve Body	Pressure Boundary

The AMR for these component types are indicated in Table 3.3.2-16, Auxiliary Systems - Essential Siphon Vacuum System - Aging Management Evaluation.

2.3.3.2.6 Spent Fuel Cooling System

System Description

The primary function of the spent fuel cooling system is to provide decay heat removal for the spent fuel stored in the spent fuel pools. Spent fuel pool heat removal is accomplished by recirculating spent fuel coolant water through heat exchangers and then back to the pool. In addition to decay heat removal, the system provides for purification of the spent fuel pool water, the fuel transfer canal water, and the content of the borated water storage tank, in order to remove fission and corrosion products and to maintain water clarity for fuel handling operations. The system also provides inventory makeup for the fuel transfer canal and the incore instrument handling tank.

System Intended Functions

Portions of the spent fuel cooling system are relied upon to maintain containment integrity. Portions of the spent fuel cooling system also provide a source of makeup water to the standby shutdown facility and letdown storage capability for reactor coolant system inventory, drain accumulated reactor building spray water (post actuation) from the fuel transfer canal, and provide emergency makeup to the spent fuel pool to maintain shielding. Therefore, the spent fuel cooling system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the spent fuel cooling system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the spent fuel cooling system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the spent fuel cooling system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the spent fuel cooling system are relied upon for compliance with fire protection (10 CFR 50.48) regulations and SBO (10 CFR 50.63) regulations. Therefore, the spent fuel cooling system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the spent fuel cooling system can be found in UFSAR Sections 9.1.3 and 9.1.3.3.1, and Figure 9-5.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the spent fuel cooling system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-104A-1.1
- OSLRD-104A-1.2
- OSLRD-104A-1.3
- OSLRD-104A-1.4
- OSLRD-104A-3.1
- OSLRD-104A-3.2

Secondary Drawings

- OSLRD-101A-1.5
- OSLRD-101A-2.5
- OSLRD-101A-3.5
- OSLRD-102A-1.1
- OSLRD-102A-2.1
- OSLRD-125A-1.4
- OSLRD-125A-3.4

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.2-6, Spent Fuel Cooling System.

Table 2.3.3.2-6 Spent Fuel Cooling System

Component/Commodity Group	Intended Functions
Accumulator	Pressure Boundary
Bolting	Pressure Boundary Structural Integrity
Filter Body	Pressure Boundary Structural Integrity
Flexible Connection	Pressure Boundary Structural Integrity
Flow Element	Flow Restriction Pressure Boundary Structural Integrity

Table 2.3.3.2-6 Spent Fuel Cooling System

Component/Commodity Group	Intended Functions
Heat Exchanger (spent fuel cooler A, B) Head	Pressure Boundary
Heat Exchanger (spent fuel cooler A, B) Shell	Pressure Boundary
Heat Exchanger (spent fuel cooler A, B) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (spent fuel cooler A, B) Tubesheet	Pressure Boundary
Heat Exchanger (spent fuel cooler C) Nozzle	Pressure Boundary
Heat Exchanger (spent fuel cooler C) Plate	Heat Transfer Pressure Boundary
Heat Exchanger (spent fuel cooler C) Tie Rod	Pressure Boundary
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Pump Casing (borated water recirculation)	Structural Integrity
Pump Casing (priming)	Structural Integrity
Pump Casing (reverse osmosis feed)	Structural Integrity
Pump Casing (reverse osmosis feed booster)	Structural Integrity
Pump Casing (spent fuel cooling)	Pressure Boundary
Sight Glass	Structural Integrity
Tank (incore instrument handling)	Structural Integrity
Tank (spent fuel demineralizer)	Pressure Boundary

Table 2.3.3.2-6 Spent Fuel Cooling System

Component/Commodity Group	Intended Functions
Tank (spent fuel priming)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR for these component types are indicated in Table 3.3.2-17, Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation.

2.3.3.3 Closed Cycle Water Related Systems

2.3.3.3.1 Alternate Chilled Water System

System Description

The alternate chilled water system provides defense in depth for the existing environmental cooling systems in the auxiliary building, control complex, and reactor buildings.

Two (2) skid-mounted air-cooled chillers produce chilled water that is then routed through dedicated header piping to air handling units of identified plant areas.

System Intended Functions

Portions of the alternate chilled water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the alternate chilled water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the alternate chilled water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the alternate chilled water system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the alternate chilled water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the alternate chilled water system can be found in UFSAR Sections 9.2.5, 9.2.5.3, and 9.4.1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the alternate chilled water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-116Q-1.1
- OSLRD-116Q-1.2
- OSLRD-116Q-1.3
- OSLRD-116Q-1.4

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.3-1, Alternate Chilled Water System.

Table 2.3.3.3-1 Alternate Chilled Water System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary
Flexible Connection	Pressure Boundary
Heat Exchanger (alternate chiller 1,2 condenser) Fins	Heat Transfer
Heat Exchanger (alternate chiller 1,2 condenser) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (alternate chiller 1,2 evaporator) Head	Pressure Boundary
Heat Exchanger (alternate chiller 1,2 evaporator) Shell	Pressure Boundary
Heat Exchanger (alternate chiller 1,2 evaporator) Tubes	Heat Transfer Pressure Boundary

Table 2.3.3.3-1 Alternate Chilled Water System

Component/Commodity Group	Intended Functions
Heat Exchanger (alternate chiller 1,2 evaporator) Tubesheet	Pressure Boundary
Hose (stored equipment)	Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Pump Casing (alternate chiller 1,2)	Pressure Boundary
Strainer Body	Pressure Boundary
Strainer Screen	Filtration
Tank (air separator)	Pressure Boundary
Tank (captive air expansion)	Pressure Boundary
Tank (chemical addition)	Pressure Boundary
Tank Bladder (captive air expansion)	Pressure Boundary
Valve Body	Pressure Boundary

The AMR results for these component types are indicated in Table 3.3.2-18, Auxiliary Systems – Alternate Chilled Water System - Aging Management Evaluation.

2.3.3.3.2 Component Cooling Water System

System Description

The component cooling water system provides cooling water to various components in the reactor building.

Five component coolers are provided for the three units. Units 1 and 2 each have a single cooler with a third as a common spare. Unit 3 has one cooler and one spare.

System Intended Functions

Portions of the component cooling water system are relied upon to maintain containment integrity. Therefore, the component cooling water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the component cooling water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the component cooling water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the component cooling water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the component cooling water system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and EQ (10 CFR 50.49). Therefore, the component cooling water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the component cooling water system can be found in UFSAR Section 9.2.1.1 and Figure 9-8.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the component cooling water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-144A-1.1
- OSLRD-144A-1.2
- OSLRD-144A-1.3
- OSLRD-144A-1.4
- OSLRD-144A-2.1
- OSLRD-144A-2.2
- OSLRD-144A-2.3
- OSLRD-144A-3.1
- OSLRD-144A-3.2
- OSLRD-144A-3.3

Secondary Drawings

- OSLRD-124B-1.1
- OSLRD-124B-2.1
- OSLRD-124B-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.3-2, Component Cooling Water System.

Table 2.3.3.3-2 Component Cooling Water System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Filter Body	Structural Integrity
Flexible Connection	Structural Integrity
Flow Element	Structural Integrity
Heat Exchanger (component cooler) Head	Structural Integrity
Heat Exchanger (component cooler) Shell	Structural Integrity

Table 2.3.3.3-2 Component Cooling Water System

Component/Commodity Group	Intended Functions
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Pump Casing (component cooling)	Structural Integrity
Pump Casing (drain tank)	Structural Integrity
Sight Glass	Structural Integrity
Tank (chemical addition)	Structural Integrity
Tank (drain)	Structural Integrity
Tank (surge)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-19, Auxiliary Systems – Component Cooling Water System - Aging Management Evaluation.

2.3.3.3.3 Chilled Water (Non-Vital Loads) System

<u>System Description</u>

The chilled water (non-vital loads) system provides chilled water to various air handling units throughout non-vital areas of the auxiliary building and turbine building.

<u>System Intended Functions</u>

Portions of the chilled water (non-vital loads) system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the chilled water (non-vital loads) system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the chilled water (non-vital loads) system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the chilled water (non-vital loads) system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the chilled water (non-vital loads) system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the chilled water (non-vital loads) system can be found in UFSAR Sections 9.2.5 and 9.4.2.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the chilled water (non-vital loads) system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-116H-1.1
- OSLRD-116H-1.3
- OSLRD-116H-1.4
- OSLRD-116H-2.4
- OSLRD-116H-3.4

Secondary Drawings

- OSLRD-124B-1.6
- OSLRD-124B-3.6
- OSLRD-133A-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.3-3, Chilled Water (Non-Vital Loads) System.

Table 2.3.3.3-3 Chilled Water (Non-Vital Loads) System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Flow Element	Flow Restriction Pressure Boundary Structural Integrity
Heat Exchanger (C/D chiller condenser) Head	Structural Integrity
Heat Exchanger (C/D chiller condenser) Shell	Structural Integrity
Heat Exchanger (C/D chiller cooler) Head	Structural Integrity
Heat Exchanger (C/D chiller cooler) Shell	Structural Integrity
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Pump Casing (chilled water booster)	Structural Integrity
Pump Casing (primary chilled water)	Structural Integrity
Pump Casing (secondary distribution)	Structural Integrity
Sight Glass	Structural Integrity

Table 2.3.3.3-3 Chilled Water (Non-Vital Loads) System

Component/Commodity Group	Intended Functions
Strainer Body	Pressure Boundary Structural Integrity
Strainer Screen	Filtration
Tank (compression)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-20, Auxiliary Systems – Chilled Water (Non-Vital Loads) System - Aging Management Evaluation.

2.3.3.3.4 Recirculating Cooling Water System

System Description

The recirculating cooling water system provides closed cycle cooling water to various components outside the reactor building.

The recirculating cooling water system consists of two parallel loops which are normally isolated from each other. One loop supplies cooling for shared station loads, Unit 1 and 2 loads, and secondary loads on Unit 3. The other loop supplies cooling for Unit 3 primary loads.

System Intended Functions

Portions of the recirculating cooling water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the recirculating cooling water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the recirculating cooling water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the recirculating cooling water system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the recirculating cooling water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the recirculating cooling water system can be found in UFSAR Section 9.2.2.2.4 and Figure 9-13.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the recirculating cooling water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-125A-1.1
- OSLRD-125A-1.2
- OSLRD-125A-1.3
- OSLRD-125A-1.4
- OSLRD-125A-1.5
- OSLRD-125A-1.6
- OSLRD-125A-2.1
- OSLRD-125A-2.2
- OSLRD-125A-2.3
- OSLRD-125A-2.4
- OSLRD-125A-3.1
- OSLRD-125A-3.2
- OSLRD-125A-3.3
- OSLRD-125A-3.4
- OSLRD-125A-3.5
- OSLRD-125A-3.6

Secondary Drawings

- OSLRD-110A-1.4
- OSLRD-110A-1.13
- OSLRD-110A-2.4
- OSLRD-110A-3.4
- OSLRD-127B-1.1
- OSLRD-127B-3.1
- OSLRD-133A-1.4
- OSLRD-133A-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.3-4, Recirculating Cooling Water System.

Table 2.3.3.3-4 Recirculating Cooling Water System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Eductor	Structural Integrity
Expansion Joint	Pressure Boundary
Flexible Connection	Structural Integrity
Flow Element	Flow Restriction Pressure Boundary
Heat Exchanger (U0 recirculating cooling water A, B, C, D) Head	Pressure Boundary
Heat Exchanger (U0 recirculating cooling water A, B, C, D) Shell	Pressure Boundary
Heat Exchanger (U0 recirculating cooling water A, B, C, D) Tubes	Pressure Boundary Heat Transfer
Heat Exchanger (U0 recirculating cooling water A, B, C, D) Tubesheet	Pressure Boundary

Table 2.3.3.3-4 Recirculating Cooling Water System

Component/Commodity Group	Intended Functions
Heat Exchanger (U3 recirculating cooling water 3A, 3B) Cover	Pressure Boundary
Heat Exchanger (U3 recirculating cooling water 3A, 3B) Plate	Pressure Boundary Heat Transfer
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Pump Casing (recirculating cooling water)	Pressure Boundary
Sight Glass	Pressure Boundary Structural Integrity
Tank (chemical addition)	Structural Integrity
Tank (recirculating cooling water surge)	Pressure Boundary
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-21, Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation.

2.3.3.3.5 Sample Cooling Water System

System Description

The sample cooling water system is used to cool samples taken from the secondary side of Units 1, 2, and 3. The system is closed loop with a single cooling water chiller unit that chills water and provides the required pumping head to send the cooling water through several sample coolers.

System Intended Functions

Portions of the sample cooling water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the sample cooling water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the sample cooling water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the sample cooling water system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the sample cooling water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- None

Secondary Drawings

- OSLRD-110A-1.13

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.3-5, Sample Cooling Water System.

Table 2.3.3.3-5 Sample Cooling Water System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Heat Exchanger (chiller condenser) Head	Structural Integrity
Heat Exchanger (chiller condenser) Shell	Structural Integrity
Heat Exchanger (chiller evaporator) Head	Structural Integrity
Heat Exchanger (chiller evaporator) Shell	Structural Integrity
Piping	Structural Integrity
Pump Casing (chilled water)	Structural Integrity
Tank (sample cooling water surge)	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-22, Auxiliary Systems - Sample Cooling Water System - Aging Management Evaluation.

2.3.3.3.6 Chilled Water (Vital Loads) System

System Description

The chilled water (vital loads) system provides chilled water for the control room ventilation system for all three units. The chilled water (vital loads) system is required for normal unit operation and to maintain temperatures below equipment operating limits during emergency operation. Two chillers are provided for the system, each with 100% capacity. The equipment is arranged in two parallel redundant trains with one supply and return line and each train capable of supplying the required cooling capacity.

System Intended Functions

Portions of the chilled water (vital loads) system provide chilled water to air handling units for control room envelope pressurization and cooling, as well as cooling for the cable and equipment rooms, for events where the control room remains occupied. Therefore, the chilled water (vital loads) system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the chilled water (vital loads) system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the chilled water (vital loads) system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the chilled water (vital loads) system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the chilled water (vital loads) system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the chilled water (vital loads) system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the chilled water (vital loads) system can be found in UFSAR Sections 9.2.5 and 9.4.1, and Figure 9-24.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the chilled water (vital loads) system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-116J-1.5
- OSLRD-116J-1.6
- OSLRD-116J-3.3

Secondary Drawings

- OSLRD-124A-1.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.3-6, Chilled Water (Vital Loads) System.

Table 2.3.3.3-6 Chilled Water (Vital Loads) System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Flow Element	Flow Restriction Pressure Boundary
Heat Exchanger (A/B chiller condenser) Fins	Heat Transfer
Heat Exchanger (A/B chiller condenser) Head	Pressure Boundary
Heat Exchanger (A/B chiller condenser) Shell	Pressure Boundary
Heat Exchanger (A/B chiller condenser) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (A/B chiller condenser) Tubesheet	Pressure Boundary
Heat Exchanger (A/B chiller evaporator) Fins	Heat Transfer
Heat Exchanger (A/B chiller evaporator) Head	Pressure Boundary
Heat Exchanger (A/B chiller evaporator) Shell	Pressure Boundary

Table 2.3.3.3-6 Chilled Water (Vital Loads) System

Component/Commodity Group	Intended Functions
Heat Exchanger (A/B chiller evaporator) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (A/B chiller evaporator) Tubesheet	Pressure Boundary
Heat Exchanger (temporary chiller condenser) Fins	Heat Transfer
Heat Exchanger (temporary chiller condenser) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (temporary chiller evaporator) Head	Pressure Boundary
Heat Exchanger (temporary chiller evaporator) Shell	Pressure Boundary
Heat Exchanger (temporary chiller evaporator) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (temporary chiller evaporator) Tubesheet	Pressure Boundary
Orifice	Flow Restriction Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Pump Casing (chilled water)	Pressure Boundary
Sight Glass	Pressure Boundary Structural Integrity
Strainer Body	Pressure Boundary
Strainer Screen	Filtration
Tank (chemical feeder)	Structural Integrity
Tank (makeup water 15 gallons)	Structural Integrity

Table 2.3.3.3-6 Chilled Water (Vital Loads) System

Component/Commodity Group	Intended Functions
Tank (makeup water 48 gallons)	Pressure Boundary
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-23, Auxiliary System - Chilled Water (Vital Loads) System - Aging Management Evaluation.

2.3.3.4 Fire Protection Related Systems

2.3.3.4.1 High Pressure Service Water System

System Description

The high pressure service water system provides a source of water for fire protection throughout the station. The high pressure service water system consists of two motor driven large capacity pumps and one motor driven small capacity (jockey) pump which, together with the elevated water storage tank, provide a reliable source of fire protection, bearing lubrication, sealing, and cooling water to the three Oconee units. The source of high pressure service water system is from the condenser circulating water crossover lines via headers shared with Units 1 and 2 low pressure service water pumps. A header and network of piping carries high pressure service water system throughout the station. A yard header forms a complete loop around the main station structure. The yard header serves primarily fire hydrants around the yard but also serves as a main header for branch lines to a variety of site structures.

The high pressure service water system supplies water at sufficient pressure and flow rate to sprinkler systems, mulsifyer systems, hose stations, fire hydrants, and deluge systems throughout the station and surrounding areas. High pressure service water system also supplies sealing or cooling water to various loads.

System Intended Functions

Portions of the high pressure service water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Non-safety related components of the high pressure service water system are relied upon to prevent air in-leakage from air binding low pressure service water pumps if the elevated water storage tank is depleted. Portions of the high pressure service water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the high pressure service water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the high pressure service water system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) regulations. Therefore, the high pressure service water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the high pressure service water system can be found in UFSAR Sections 9.2.2.1, 9.2.2.2.2, 9.7.3.4.2, 10.4.7.2.2 and Figure 9-10.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the high pressure service water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-124C-1.1
- OSLRD-124C-1.2
- OSLRD-124C-1.3
- OSLRD-124C-1.4
- OSLRD-124C-1.5
- OSLRD-124C-1.6
- OSLRD-124C-1.7
- OSLRD-124C-1.8
- OSLRD-124C-1.9
- OSLRD-124C-1.10
- OSLRD-124C-2.2
- OSLRD-124C-2.3
- OSLRD-124C-2.7
- OSLRD-124C-2.8
- OSLRD-124C-3.2
- OSLRD-124C-3.3
- OSLRD-124C-3.7

Secondary Drawings

- OSLRD-121C-1.1
- OSLRD-121C-2.1
- OSLRD-121C-3.1

- OSLRD-124A-2.2
- OSLRD-124B-1.1
- OSLRD-124B-2.1
- OSLRD-124B-3.1
- OSLRD-133A-1.1
- OSLRD-133A-1.4

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.4-1, High Pressure Service Water System.

Table 2.3.3.4-1 High Pressure Service Water System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Expansion Joint	Pressure Boundary
Filter Body	Pressure Boundary
Fire Hydrant	Pressure Boundary
Flow Element	Flow Restriction Pressure Boundary
Heat Exchanger (high pressure service water motor air cooler) Fins	Heat Transfer
Heat Exchanger (high pressure service water motor air cooler) Head	Pressure Boundary
Heat Exchanger (high pressure service water motor air cooler) Tubes	Heat Transfer Pressure Boundary
Orifice	Flow Restriction Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity

Table 2.3.3.4-1 High Pressure Service Water System

Component/Commodity Group	Intended Functions
Pump Casing (high pressure service water)	Pressure Boundary
Pump Casing (high pressure service water jockey)	Pressure Boundary
Sprinkler Head	Pressure Boundary Spray Pattern Structural Integrity
Strainer Body	Pressure Boundary Structural Integrity
Strainer Screen	Filtration
Tank (elevated water storage)	Pressure Boundary
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-24, Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation.

2.3.3.4.2 Keowee Service Water System

System Description

The Keowee service water system provides cooling water from Lake Keowee to various Keowee plant components and pre-lubrication for unwatering sump pumps.

System Intended Functions

Portions of the Keowee service water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee service water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee service water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the Keowee service water system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee service water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- KSLRD-109A-1.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.4-2, Keowee Service Water System.

Table 2.3.3.4-2 Keowee Service Water System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity

Table 2.3.3.4-2 Keowee Service Water System

Component/Commodity Group	Intended Functions
Heat Exchanger (equipment gallery air handling unit) Head	Structural Integrity
Heat Exchanger (equipment gallery air handling unit) Tubes	Structural Integrity
Piping	Structural Integrity
Pump Casing (sodium hypochlorite metering)	Structural Integrity
Strainer Body	Structural Integrity
Tank (chlorine tank)	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-25, Auxiliary Systems - Keowee Service Water System - Aging Management Evaluation.

2.3.3.4.3 Keowee Fire Detection/Protection System

System Description

The Keowee fire detection/protection system includes fire detection components that monitor for smoke and/or fire, and fire suppression components such as fire extinguishers, hydrants, hose racks, and a fire pump. Fire water is delivered to Keowee fire detection/protection system by the Keowee intake line. The system also includes passive fire protection features including fire doors and fire penetration seals.

System Intended Functions

Portions of the Keowee fire detection/protection system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee fire detection/protection system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee fire detection/protection system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the Keowee fire detection/protection system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) regulations. Therefore, the Keowee fire detection/protection system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the Keowee fire detection/protection system can be found in UFSAR Section 9.5.1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee fire detection/protection system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- None

Secondary Drawings

- KSLRD-109A-1.1
- KSLRD-109A-1.2
- OSLRD-117B-1.5

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.4-3, Keowee Fire Detection/ Protection System.

Table 2.3.3.4-3 Keowee Fire Detection/Protection System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Fire Hydrant	Pressure Boundary
Flow Element	Flow Restriction Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Pump Casing (fire protection)	Pressure Boundary
Sprinkler Head	Pressure Boundary Spray Pattern
Strainer Body	Pressure Boundary
Strainer Screen	Filtration
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-26, Auxiliary Systems - Keowee Fire Detection/Protection System - Aging Management Evaluation.

2.3.3.5 Heating Ventilation and Air Conditioning Related Systems

2.3.3.5.1 Reactor Building Cooling and Ventilation Systems

System Description

The reactor building cooling and ventilation systems are divided into two systems as identified in the UFSAR, the reactor building cooling system and the reactor building ventilation system.

The reactor building cooling system consists of the reactor building cooling units that are designed to remove heat from the reactor building following a design basis accident. Heat removal is necessary to maintain acceptable internal reactor building pressure and temperatures.

The reactor building ventilation system consists of the reactor building auxiliary cooling units and the control rod drive structure fans. These cooling units and fans provide cooling for the reactor building atmosphere and control rod drive structures during normal plant operations, and do not have a post accident or regulated event function.

System Intended Functions

Portions of the reactor building cooling and ventilation system are relied upon to provide sufficient heat removal from the containment atmosphere during post accident conditions to assist in maintaining reactor building atmosphere within the environmental envelope to assure component operability. This intended function is limited to the reactor building cooling system. Therefore, the reactor building cooling and ventilation system is within the scope of license renewal in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the reactor building cooling and ventilation system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the reactor building cooling and ventilation system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the reactor building cooling and ventilation system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the reactor building cooling and ventilation system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and EQ (10 CFR 50.49). This intended function is limited to the reactor building cooling system. Therefore, the reactor building cooling and ventilation system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the reactor building cooling and ventilation systems can be found in UFSAR Sections 6.2.2, 9.4.6 and Figure 6-3.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the reactor building cooling and ventilation system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-116D-1.1
- OSLRD-116D-2.1
- OSLRD-116D-3.1
- OSLRD-116E-1.1
- OSLRD-116E-2.1
- OSLRD-116E-3.1

Secondary Drawings

- OSLRD-124B-1.2
- OSLRD-124B-1.3
- OSLRD-124B-2.2
- OSLRD-124B-2.3
- OSLRD-124B-3.2
- OSLRD-124B-3.3

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.5-1, Reactor Building Cooling and Ventilation Systems.

Table 2.3.3.5-1 Reactor Building Cooling and Ventilation Systems

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Cooling Coil (reactor building cooling units) Casing	Pressure Boundary
Cooling Coil (reactor building cooling units) Fins	Heat Transfer
Cooling Coil (reactor building cooling units) Head	Pressure Boundary
Cooling Coil (reactor building cooling units) Tubes	Heat Transfer Pressure Boundary
Drain Pan	Structural Integrity
Ducting	Pressure Boundary
Expansion Joint	Pressure Boundary
Fan Casing (reactor building cooling units)	Pressure Boundary
Piping	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-27, Auxiliary Systems - Reactor Building Cooling System - Aging Management Evaluation.

2.3.3.5.2 Reactor Building Purge System

System Description

The reactor building purge system purges the reactor building with fresh air whenever desired during unit outages.

System Intended Functions

Portions of the reactor building purge system are relied upon to maintain containment integrity. Therefore, the reactor building purge system is within the scope of license renewal in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the reactor building purge system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the reactor building purge system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the reactor building purge system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the reactor building purge system are relied upon for compliance with regulations for EQ (10 CFR 50.49). Therefore, the reactor building purge system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional Details of the reactor building purge system can be found in UFSAR Sections 6.2.3, 9.4.5 and Figure 6-4.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the reactor building purge system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-116A-1.1
- OSLRD-116A-2.1
- OSLRD-116A-3.1
- OSLRD-116C-1.1
- OSLRD-116C-2.1
- OSLRD-116C-3.1

Secondary Drawings

- OSLRD-107B-1.1
- OSLRD-107B-2.1
- OSLRD-107B-3.1
- OSLRD-110A-1.3
- OSLRD-110A-2.3
- OSLRD-110A-3.3
- OSLRD-148B-1.2
- OSLRD-148B-2.2
- OSLRD-148B-3.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.5-2, Reactor Building Purge System.

Table 2.3.3.5-2 Reactor Building Purge System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Ducting	Structural Integrity
Heating Coil (purge supply unit) Head	Structural Integrity
Heating Coil (purge supply unit) Tubes	Structural Integrity
Piping	Pressure Boundary Structural Integrity

Table 2.3.3.5-2 Reactor Building Purge System

Component/Commodity Group	Intended Functions
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-28, Auxiliary Systems - Reactor Building Purge System - Aging Management Evaluation.

2.3.3.5.3 Ventilation Systems

System Description

The ventilation systems includes the following systems:

The control room pressurization and filtration system maintains a suitable environment in the control room for personnel and equipment during normal operation. During emergency operation the system supplies the control room with 100% filtered outside air and maintains a positive pressure to prevent in-leakage of radioactive effluents or toxic gases.

The standby shutdown facility heating ventilation and air conditioning system provides ventilation and air conditioning to the standby shutdown facility when it is required for event mitigation. The system maintains standby shutdown facility temperatures within acceptable limits to prevent equipment failures.

The spent fuel pool area ventilation system maintains a suitable environment in the spent fuel pool area for the proper operation, maintenance and testing of equipment as well as for personnel access.

The auxiliary building ventilation system and auxiliary building air conditioning system maintain the auxiliary building at a negative pressure with respect to the turbine building and outside areas so that any potential contamination will be monitored and discharged through the Unit Vent. The auxiliary building ventilation system also maintains temperature limits in the auxiliary building during normal plant operations.

The penetration room ventilation system maintains a negative pressure in the penetration room. With the adoption of alternate source term, this function is no longer required for post accident operation. This system also provides cooling to the penetration rooms.

The turbine building ventilation system generally maintains a suitable environment in the turbine building for personnel and equipment, including the Unit 1 & 2 and Unit 3 blockhouses.

The miscellaneous structures heating ventilation and air conditioning system serves various structures, including Tech Support Offices, Interim Radwaste Building, guardhouse, contaminated tool storage, 525 KV relay house, lube oil station, Maintenance Support Building, Warehouse No. 6 and the 230 KV Relay House. The 230 KV relay house heating ventilation and air conditioning maintains temperatures within acceptable limits.

The protected service water building heating ventilation and air conditioning system supports operation of systems and equipment located in the protected service water building by maintaining temperatures within design limits. The protected service water building heating ventilation and air conditioning is designed to maintain the transformer and battery rooms within their design temperature range.

System Intended Functions

Portions of the ventilation systems are relied upon to maintain a suitable environment within acceptable limits in the control room, equipment room, standby shutdown facility, and protected service water building. Therefore, the ventilation systems are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the ventilation systems contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54(a)(1) function. Non-safety related components of the ventilation systems maintain temperatures for the control battery rooms, the 230 KV switchyard relay house, the CT4 blockhouse and switchgear room, and the Unit 3 blockhouse within acceptable limits. Portions of the ventilation systems contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the ventilation systems are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(2).

Portions of the ventilation systems are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the ventilation systems are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the ventilation systems can be found in UFSAR Sections 6.4, 6.5, 9.4.1, 9.4.2, 9.4.3, 9.4.4, 9.4.7, 9.4.8, 9.6.3.6.4, 9.7.3.4.3, Figures 6-4, 9-24, 9-25, 9-26, 9-27 and 9-28.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the ventilation system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-116B-1.1
- OSLRD-116B-2.1
- OSLRD-116B-3.1
- OSLRD-116F-1.1
- OSLRD-116F-3.1
- OSLRD-116G-1.1
- OSLRD-116G-1.2
- OSLRD-116G-1.3
- OSLRD-116G-2.1
- OSLRD-116G-3.1
- OSLRD-116G-3.2
- OSLRD-116G-3.3
- OSLRD-116H-1.2
- OSLRD-116J-1.1
- OSLRD-116J-1.2
- OSLRD-116J-3.1
- OSLRD-116J-3.2
- OSLRD-116K-1.1
- OSLRD-116K-1.2
- OSLRD-116K-1.3
- OSLRD-116K-2.1
- OSLRD-116K-3.1
- OSLRD-116M-1.4
- OSLRD-116M-1.8
- OSLRD-116N-1.1

Secondary Drawings

- OSLRD-116H-1.1
- OSLRD-116H-1.3
- OSLRD-116H-1.4
- OSLRD-116H-2.4
- OSLRD-116H-3.4
- OSLRD-116J-1.6
- OSLRD-116J-3.3
- OSLRD-116Q-1.4
- OSLRD-124A-3.3

- OSLRD-124B-1.6
- OSLRD-124B-3.6
- OSLRD-125A-1.3
- OSLRD-125A-2.2
- OSLRD-125A-3.3
- OSLRD-127A-1.2
- OSLRD-127A-2.2
- OSLRD-127A-3.2
- OSLRD-148B-1.2
- OSLRD-148B-2.2
- OSLRD-148B-3.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.5-3, Ventilation System.

Table 2.3.3.5-3 Ventilation System

Component/Commodity Group	Intended Functions
Air Handling Unit (230 KV relay house) Housing	Pressure Boundary
Air Handling Unit (auxiliary building Unit 3 battery room) Housing	Pressure Boundary
Air Handling Unit (auxiliary building ventilation supply units) Housing	Pressure Boundary
Air Handling Unit (cable room units 1-34, 2-35, 3-11, 3-12) Housing	Pressure Boundary
Air Handling Unit (cable room units 1-52, 1-53, 2-52, 2-53) Housing	Pressure Boundary
Air Handling Unit (control room ventilation units -11, -12, 3-13, 3-14) Housing	Pressure Boundary
Air Handling Unit (equipment room) Housing	Pressure Boundary
Air Handling Unit (penetration room) Housing	Pressure Boundary
Air Handling Unit (standby shutdown facility building 0-42) Housing	Pressure Boundary

Table 2.3.3.5-3 Ventilation System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Condenser Unit (230 KV relay house air handling units) Fins	Heat Transfer
Condenser Unit (230 KV relay house air handling units) Tubes	Heat Transfer Pressure Boundary
Condenser Unit (auxiliary building unit 3 battery room air handling unit) Fins	Heat Transfer
Condenser Unit (auxiliary building unit 3 battery room air handling unit) Tubes	Heat Transfer Pressure Boundary
Cooling Coil (alternator air cooler) Head	Structural Integrity
Cooling Coil (alternator air cooler) Tubes	Structural Integrity
Cooling Coil (automatic voltage regulating building air handling units) Head	Structural Integrity
Cooling Coil (automatic voltage regulating building air handling units) Tubes	Structural Integrity
Cooling Coil (auxiliary building ventilation air handling unit 0-13, -27, -29, -30, -31, -32, -36, -44, -45, -46, -47, -49) Head	Structural Integrity
Cooling Coil (auxiliary building ventilation air handling unit 0-13, -27, -29, -30, -31, -32, -36, -44, -45, -46, -47, -49) Tubes	Structural Integrity
Cooling Coil (auxiliary building ventilation supply units) Fins	Heat Transfer
Cooling Coil (auxiliary building ventilation supply units) Head	Pressure Boundary
Cooling Coil (auxiliary building ventilation supply units) Tubes	Heat Transfer Pressure Boundary

Table 2.3.3.5-3 Ventilation System

Component/Commodity Group	Intended Functions
Cooling Coil (cable room air handling units 1-34, 2-35, 3-11, 3-12) Fins	Heat Transfer
Cooling Coil (cable room air handling units 1-34, 2-35, 3-11, 3-12) Head	Pressure Boundary
Cooling Coil (cable room air handling units 1-34, 2-35, 3-11, 3-12) Tubes	Heat Transfer Pressure Boundary
Cooling Coil (cable room air handling units 1-52, 1-53, 2-52, 2-53) Fins	Heat Transfer
Cooling Coil (cable room air handling units 1-52, 1-53, 2-52, 2-53) Head	Pressure Boundary
Cooling Coil (cable room air handling units 1-52, 1-53, 2-52, 2-53) Tubes	Heat Transfer Pressure Boundary
Cooling Coil (calibration room air handling unit 0-35) Head	Structural Integrity
Cooling Coil (calibration room air handling unit 0-35) Tubes	Structural Integrity
Cooling Coil (change room cooling units) Head	Structural Integrity
Cooling Coil (change room cooling units) Tubes	Structural Integrity
Cooling Coil (control room ventilation air handling units -11, -12, 3-13, 3-14) Head	Pressure Boundary
Cooling Coil (control room ventilation air handling units -11, -12, 3-13, 3-14) Tubes	Heat Transfer Pressure Boundary
Cooling Coil (control room ventilation air handling units -13, -14) Head	Structural Integrity

Table 2.3.3.5-3 Ventilation System

Component/Commodity Group	Intended Functions
Cooling Coil (control room ventilation air handling units -13, -14) Tubes	Structural Integrity
Cooling Coil (emergency core cooling system pump room coolers air handling units -3, -4, -5, -6, -7, -8; 3-1, 3-2, 3-3, 3-4) Head	Structural Integrity
Cooling Coil (emergency core cooling system pump room coolers air handling units -3, -4, -5, -6, -7, -8; 3-1, 3-2, 3-3, 3-4) Tubes	Structural Integrity
Cooling Coil (equipment room air handling units) Fins	Heat Transfer
Cooling Coil (equipment room air handling units) Head	Pressure Boundary
Cooling Coil (equipment room air handling units) Tubes	Heat Transfer Pressure Boundary
Cooling Coil (isolated phase bus air cooler) Tubes	Structural Integrity
Cooling Coil (penetration room air handling units) Fins	Heat Transfer
Cooling Coil (penetration room air handling units) Head	Pressure Boundary
Cooling Coil (penetration room air handling units) Tubes	Heat Transfer Pressure Boundary
Cooling Coil (power battery enclosure air handling unit 1-17) Tubes	Structural Integrity
Cooling Coil (power battery enclosure air handling unit 3-17) Tubes	Structural Integrity
Cooling Coil (spent fuel pool supply unit air handling units) Head	Structural Integrity
Cooling Coil (spent fuel pool supply unit air handling units) Tubes	Structural Integrity

Table 2.3.3.5-3 Ventilation System

Component/Commodity Group	Intended Functions
Damper Housing	Pressure Boundary
Drain Pan	Structural Integrity
Ducting	Pressure Boundary
Evaporator Unit (230 KV relay house air handling units) Fins	Heat Transfer
Evaporator Unit (230 KV relay house air handling units) Tubes	Heat Transfer Pressure Boundary
Evaporator Unit (auxiliary building unit 3 battery room air handling unit) Fins	Heat Transfer
Evaporator Unit (auxiliary building Unit 3 battery room air handling unit) Tubes	Heat Transfer Pressure Boundary
Evaporator Unit (protected service water building battery rooms) Housing	Pressure Boundary
Evaporator Unit (standby shutdown facility building air handling unit 0-42) Fins	Heat Transfer
Evaporator Unit (standby shutdown facility building air handling unit 0-42) Head	Pressure Boundary
Evaporator Unit (standby shutdown facility building air handling unit 0-42) Tubes	Heat Transfer Pressure Boundary
Fan (auxiliary building protected service water pump room exhaust) Housing	Pressure Boundary
Fan (auxiliary building ventilation exhaust plenum) Housing	Pressure Boundary
Fan (auxiliary building ventilation exhaust) Housing	Pressure Boundary
Fan (control room outside air booster) Housing	Pressure Boundary

Table 2.3.3.5-3 Ventilation System

Component/Commodity Group	Intended Functions
Fan (instrument air compressor room exhaust) Housing	Pressure Boundary
Fan (protected service water building battery room exhaust) Housing	Pressure Boundary
Fan (protected service water building battery room supply) Housing	Pressure Boundary
Fan (protected service water building exhaust) Housing	Pressure Boundary
Fan (standby shutdown facility building exhaust) Housing	Pressure Boundary
Fan (standby shutdown facility building supply) Housing	Pressure Boundary
Fan (standby shutdown facility diesel engine exhaust) Housing	Pressure Boundary
Filter (control room ventilation) Housing	Pressure Boundary
Filter (protected service water building battery rooms) Housing	Pressure Boundary
Filter (standby shutdown facility building inlet plenum) Housing	Pressure Boundary
Flexible Connection	Pressure Boundary
Heating Coil (auxiliary building ventilation supply units) Head	Structural Integrity
Heating Coil (auxiliary building ventilation supply units) Tubes	Structural Integrity
Heating Coil (spent fuel pool supply unit air handling units) Tubes	Structural Integrity
Piping	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-29, Auxiliary Systems - Ventilation System - Aging Management Evaluation.

2.3.3.6 Lube Oil Related Systems

2.3.3.6.1 Lube Oil System

System Description

The lubrication oil system consists of the turbine oil subsystems for the main, emergency feedwater, and feedwater turbines.

Main Turbine Oil Subsystem

The main turbine oil subsystem provides lubrication of the journal and thrust bearings of the turbine, generator, and exciter.

An external, filter type, oil purification system is interconnected with the main, emergency feedwater, and feedwater turbine oil subsystems to provide makeup oil and removal of contaminants from the lubricating oil.

Emergency Feedwater Turbine Oil Subsystem

The emergency feedwater turbine oil subsystem supplies oil at constant pressure to the hydraulic system by means of positive displacement oil pumps driven by the turbine shaft or by means of an auxiliary motor. This oil is used to supply lubrication for the bearings and gears as well as to supply hydraulic power for the governing system.

Feedwater Turbine Oil Subsystem

The feedwater turbine oil subsystem provides oil for the turbine hydraulic and lube system during normal turbine operation. The low pressure section of the pump discharges to the control system and the lubrication system while the high pressure section furnishes hydraulic oil pressure to the governor system. An emergency oil pump is included in the lube oil system to provide lube oil when the turbine is on the turning gear.

The ATWS AMSAC interfaces with the feedwater turbine oil system to sense a loss of both feedwater pumps on low control oil pressure signals.

System Intended Functions

Portions of the lube oil system provide isolation of emergency feedwater flow following a design basis event. Portions of the lube oil system also prevent emergency feedwater pump runout and steam generator tube flow induced vibration. Therefore, the lube oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the lube oil system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the lube oil system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the lube oil system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the lube oil system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and ATWS (10 CFR 50.62). Therefore, the lube oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the lube oil system can be found in UFSAR Sections 7.8.2 and 10.4.7.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the lube oil system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-135B-1.1
- OSLRD-135B-1.2
- OSLRD-135B-1.3
- OSLRD-135B-1.5
- OSLRD-135B-2.1
- OSLRD-135B-2.2
- OSLRD-135B-2.3
- OSLRD-135B-2.4
- OSLRD-135B-3.1
- OSLRD-135B-3.2

- OSLRD-135B-3.3
- OSLRD-135B-3.4

Secondary Drawings

- OSLRD-124A-1.2
- OSLRD-124A-2.2
- OSLRD-124A-3.2
- OSLRD-125A-1.3
- OSLRD-125A-2.2
- OSLRD-125A-3.3
- OSLRD-133A-1.2
- OSLRD-133A-2.2
- OSLRD-133A-3.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.6-1, Lube Oil System.

Table 2.3.3.6-1 Lube Oil System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Filter Body	Pressure Boundary Structural Integrity
Flexible Connection	Pressure Boundary Structural Integrity
Heat Exchanger (emergency feedwater pump turbine oil cooler) Head	Pressure Boundary
Heat Exchanger (emergency feedwater pump turbine oil cooler) Shell	Pressure Boundary
Heat Exchanger (emergency feedwater pump turbine oil cooler) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (emergency feedwater pump turbine oil cooler) Tubesheet	Pressure Boundary

Table 2.3.3.6-1 Lube Oil System

Component/Commodity Group	Intended Functions
Heat Exchanger (feedwater pump turbine oil cooler) Head	Structural Integrity
Heat Exchanger (feedwater pump turbine oil cooler) Shell	Structural Integrity
Heat Exchanger (main turbine oil tank oil cooler) Head	Structural Integrity
Heat Exchanger (main turbine oil tank oil cooler) Shell	Structural Integrity
Heater Vessel (lube oil purifier heater)	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Pump Casing (emergency feedwater pump turbine auxiliary oil)	Pressure Boundary
Pump Casing (emergency feedwater pump turbine oil transfer)	Structural Integrity
Pump Casing (emergency feedwater pump turbine shaft driven main oil)	Pressure Boundary
Pump Casing (feedwater pump turbine main shaft oil)	Structural Integrity
Pump Casing (feedwater pump turbine oil transfer)	Structural Integrity
Pump Casing (lube oil purifier auxiliary oil)	Structural Integrity
Pump Casing (lube oil purifier)	Structural Integrity
Pump Casing (main turbine main shaft oil)	Structural Integrity
Pump Casing (main turbine motor suction)	Structural Integrity
Pump Casing (reclaim transfer)	Structural Integrity
Sight Glass	Structural Integrity

Table 2.3.3.6-1 Lube Oil System

Component/Commodity Group	Intended Functions
Strainer Body	Structural Integrity
Tank (emergency feedwater pump turbine oil)	Pressure Boundary
Tank (feedwater pump turbine oil)	Structural Integrity
Tank (main turbine oil)	Structural Integrity
Tank (reclaim)	Structural Integrity
Tank (transfer storage oil)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-30, Auxiliary Systems - Lube Oil System - Aging Management Evaluation.

2.3.3.6.2 Keowee Turbine Guide Bearing Oil System

System Description

The Keowee turbine guide bearing oil system provides lubrication and heat removal for the Keowee turbine guide bearings. The Keowee turbine guide bearing oil system has an AC and a DC pump which draws oil from the lower oil reservoir and pumps it to the upper oil reservoir. The oil is pumped through the turbine guide bearing oil cooler, when in service, and is filtered before discharge to the upper oil reservoir. Gravity flow through the bearing shell provides bearing lubrication.

System Intended Functions

Portions of the Keowee turbine guide bearing oil system provide lubrication and heat removal for the Keowee turbine guide bearing. Therefore, the Keowee turbine guide bearing oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the Keowee turbine guide bearing oil system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the Keowee turbine guide bearing oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

No additional details of the Keowee turbine guide bearing oil system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee turbine guide bearing oil system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- KSLRD-101A-1.1
- KSLRD-101A-2.1

Secondary Drawings

- KSLRD-100A-1.1
- KSLRD-100A-2.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.6-2, Keowee Turbine Guide Bearing Oil System.

Table 2.3.3.6-2 Keowee Turbine Guide Bearing Oil System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary
Flow Element	Flow Restriction Pressure Boundary
Heat Exchanger (Keowee turbine guide bearing oil cooler) Head	Pressure Boundary
Heat Exchanger (Keowee turbine guide bearing oil cooler) Shell	Pressure Boundary
Heat Exchanger (Keowee turbine guide bearing oil cooler) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (Keowee turbine guide bearing oil cooler) Tubesheet	Pressure Boundary
Piping	Pressure Boundary
Pump Casing (Keowee turbine guide bearing oil (AC))	Pressure Boundary
Pump Casing (Keowee turbine guide bearing oil (DC))	Pressure Boundary
Strainer Body	Pressure Boundary
Strainer Screen	Filtration
Tank (Keowee lower oil reservoir)	Pressure Boundary
Tank (Keowee upper oil reservoir)	Pressure Boundary
Valve Body	Pressure Boundary

The AMR results for these component types are indicated in Table 3.3.2-31, Auxiliary Systems - Turbine Guide Bearing Oil System - Aging Management Evaluation.

2.3.3.6.3 Keowee Lube Oil System

System Description

The Keowee lube oil system provides a supply of filtered and purified lubricating oil to the high pressure oil system, governor oil system, and Keowee turbine guide bearings.

System Intended Functions

Portions of the Keowee lube oil system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee lube oil system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee lube oil system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the Keowee lube oil system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee lube oil system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- KSLRD-106A-3.0

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.6-3, Keowee Lube Oil System.

Table 2.3.3.6-3 Keowee Lube Oil System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Centrifuge Vessel	Structural Integrity
Filter Body	Structural Integrity
Heater Vessel (lube oil purifier electric heater)	Structural Integrity
Piping	Structural Integrity
Pump Casing (lube oil recirculation)	Structural Integrity
Pump Casing (lube oil reject)	Structural Integrity
Pump Casing (lube oil transfer)	Structural Integrity
Pump Casing (purified oil discharge)	Structural Integrity
Pump Casing (purified oil feed)	Structural Integrity
Sight Glass	Structural Integrity
Strainer Body	Structural Integrity

Table 2.3.3.6-3 Keowee Lube Oil System

Component/Commodity Group	Intended Functions
Tank (gravity oil)	Structural Integrity
Tank (lube oil)	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-32, Auxiliary Systems - Keowee Lube Oil System - Aging Management Evaluation.

2.3.3.7 Miscellaneous Related Systems

2.3.3.7.1 Filtered Water System

System Description

The filtered water system filters water taken from Lake Keowee via the low pressure service water or high pressure service water systems to reduce contaminants to a level acceptable for the demineralized water system influent.

System Intended Functions

Portions of the filtered water system are relied upon to maintain containment integrity. Therefore, the filtered water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the filtered water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the filtered water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the filtered water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the filtered water system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the filtered water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-126A-1.2

Secondary Drawings

- OSLRD-106E-1.1
- OSLRD-106E-2.1
- OSLRD-106E-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.7-1, Filtered Water System.

Table 2.3.3.7-1 Filtered Water System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Piping	Structural Integrity
Pump Casing (filtered water booster)	Structural Integrity
Pump Casing (fuel cask decontamination booster)	Structural Integrity
Pump Casing (fuel cask decontamination)	Structural Integrity
Strainer Body	Structural Integrity
Tank (decontamination)	Structural Integrity
Valve body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-33, Auxiliary Systems - Filtered Water System - Aging Management Evaluation.

2.3.3.7.2 Keowee Main Turbine System

System Description

The Keowee main turbine system provides motive power to turn the Keowee generator to supply emergency power to ONS during various events.

System Intended Functions

Portions of the Keowee main turbine system provide motive power to turn the Keowee generator to supply emergency power to ONS during various events. Therefore, the Keowee main turbine system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the Keowee main turbine system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee main turbine system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee main turbine system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the Keowee main turbine system are relied upon for compliance with regulations for Fire Protection (10 CFR 50.48). Therefore, the Keowee main turbine system is within the scope of license renewal in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the Keowee main turbine system can be found in UFSAR Section 8.3.1.1.1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee main turbine system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- None

Secondary Drawings

- KSLRD-100A-1.1
- KSLRD-100A-2.1
- KSLRD-105A-1.1
- KSLRD-105A-2.1
- KSLRD-111A-1.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.7-2, Keowee Main Turbine System.

Table 2.3.3.7-2 Keowee Main Turbine System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary
Piping	Pressure Boundary
Valve Body	Pressure Boundary

The AMR results for these component types are indicated in Table 3.3.2-34, Auxiliary Systems - Keowee Main Turbine System - Aging Management Evaluation.

2.3.3.7.3 Leak Rate Test System

System Description

The leak rate test system supports performance of the reactor building integrated leak rate test required in accordance with 10 CFR Part 50 Appendix J. The function of the leak rate test system is to pressurize the containment vessel and monitor leakage rates to verify the maximum allowable leakage rate specified in technical specifications is not exceeded. When not in use for leak rate testing, the leak rate test system is isolated to maintain the containment pressure boundary.

System Intended Functions

Portions of the leak rate test system are relied upon to maintain containment integrity. Therefore, the leak rate test system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the leak rate test system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the leak rate test system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the leak rate test system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

Additional details of the leak rate test system can be found in UFSAR Sections 3.1.54, 3.8.1.7.4, and 6.2.4.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the leak rate test system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-137E-1.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.7-3, Leak Rate Test System.

Table 2.3.3.7-3 Leak Rate Test System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-35, Auxiliary Systems - Leak Rate Test System - Aging Management Evaluation.

2.3.3.7.4 Plant Drinking Water System

System Description

The plant drinking water system is a conventional potable water system supporting the entire Oconee facility. The system provides water primarily for consumption, toilets, sinks and showers. The source for the plant drinking water system is the Seneca, SC municipal water system. The Keowee plant drinking water and the standby shutdown facility drinking water systems are evaluated within the plant drinking water system.

System Intended Functions

Portions of the plant drinking water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the plant drinking water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system.

Therefore, the plant drinking water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

Additional details of the plant drinking water system can be found in UFSAR Section 3.4.1.1.1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the plant drinking water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-126B-1.1
- OSLRD-126C-1.2
- OSLRD-126C-1.3
- OSLRD-126C-1.4
- OSLRD-126C-1.5
- OSLRD-126C-1.6
- OSLRD-126C-1.7

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.7-4, Plant Drinking Water System.

Table 2.3.3.7-4 Plant Drinking Water System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Orifice	Structural Integrity
Piping	Structural Integrity
Pump Casing (hot water circulation)	Structural Integrity
Pump Casing (hot water recirculation)	Structural Integrity
Tank (package steam fired water heater)	Structural Integrity
Tank (standby shutdown facility water storage)	Structural Integrity
Tank (water heater 119 gallon)	Structural Integrity
Tank (water heater 30 gallon)	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-36, Auxiliary Systems - Plant Drinking Water System - Aging Management Evaluation.

2.3.3.7.5 Radiation Monitoring System

System Description

The radiation monitoring system monitors both airborne and liquid activity in selected locations. These monitors can provide control room operators radioactivity information for personnel protection or for plant status.

System Intended Functions

Portions of the radiation monitoring system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the radiation monitoring system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the radiation monitoring system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

Portions of the radiation monitoring system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and EQ (10 CFR 50.49). Therefore, the radiation monitoring system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the radiation monitoring system can be found in UFSAR Sections 7.5.2, 11.5, 12.3.3 12.4.5.2, Tables 11-7 and 12-3.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the radiation monitoring system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- None

Secondary Drawings

- OSLRD-116F-1.1
- OSLRD-116F-3.1
- OSLRD-121C-1.4
- OSLRD-121C-2.3
- OSLRD-121C-3.3
- OSLRD-124B-1.5
- OSLRD-124B-3.5
- OSLRD-125A-1.1
- OSLRD-125A-3.1
- OSLRD-133A-1.5
- OSLRD-133A-3.4
- OSLRD-144A-1.1
- OSLRD-144A-2.1
- OSLRD-144A-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.7-5, Radiation Monitoring System.

Table 2.3.3.7-5 Radiation Monitoring System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Heat Exchanger (1,2RIA-35 and RIA-31) Head	Structural Integrity
Heat Exchanger (1,2RIA-35 and RIA-31) Shell	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Pump Casing (1RIA-35 sample)	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-37, Auxiliary Systems - Radiation Monitoring System - Aging Management Evaluation.

2.3.3.7.6 Stator Coolant System

System Description

The stator coolant system is a closed-loop system designed to circulate high purity water to cool the generator stator windings and the static rectifier units.

System Intended Functions

Portions of the stator coolant system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the stator coolant system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the stator coolant system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the stator coolant system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the stator coolant system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-121A-1.11
- OSLRD-121A-2.11
- OSLRD-121A-3.11

Secondary Drawings

- OSLRD-121A-1.4
- OSLRD-121A-2.4
- OSLRD-121A-3.4
- OSLRD-135C-1.1
- OSLRD-135C-2.1
- OSLRD-135C-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.7-6, Stator Coolant System.

Table 2.3.3.7-6 Stator Coolant System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Filter Body	Structural Integrity
Flow Element	Structural Integrity
Heat Exchanger (generator water) Head	Structural Integrity
Heat Exchanger (generator water) Shell	Structural Integrity
Piping	Structural Integrity
Pump Casing (stator cooling)	Structural Integrity
Strainer Body	Structural Integrity
Tank (ion exchanger demineralizer)	Structural Integrity

Table 2.3.3.7-6 Stator Coolant System

Component/Commodity Group	Intended Functions
Tank (stator coolant storage)	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-38, Auxiliary Systems - Stator Coolant System - Aging Management Evaluation.

2.3.3.7.7 Station Sewage Disposal System

System Description

The station sewage disposal system is a conventional sewage treatment system that serves the entire ONS facility. Station sanitary waste effluents are collected by the sewage ejectors and lift stations and pumped to the waste surge basin for further treatment. The standby shutdown facility sanitary lift system is evaluated within the station sewage disposal system.

System Intended Functions

Portions of the station sewage disposal system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the station sewage disposal system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the station sewage disposal system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the station sewage disposal system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the station sewage disposal system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-126B-1.1
- OSLRD-126D-1.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.7-7, Station Sewage Disposal System.

Table 2.3.3.7-7 Station Sewage Disposal System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Piping	Structural Integrity
Tank (sewage ejector surge)	Structural Integrity
Tank (sewage ejector)	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-39, Auxiliary Systems - Station Sewage Disposal System - Aging Management Evaluation.

2.3.3.7.8 Keowee Turbine Sump Pump System

System Description

The Keowee turbine sump pump system pumps normal water accumulation from the Keowee turbine wheel pit to the Keowee tailrace.

System Intended Functions

Portions of the Keowee turbine sump pump system are relied upon to prevent water entering the turbine oil reservoir. Therefore, the Keowee turbine sump pump system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the Keowee turbine sump pump system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee turbine sump pump system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee turbine sump pump system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the Keowee turbine sump pump system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the Keowee turbine sump pump system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

No additional details of the Keowee turbine sump pump system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee turbine sump pump system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- KSLRD-102A-1.1
- KSLRD-102A-2.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.7-8, Keowee Turbine Sump Pump System.

Table 2.3.3.7-8 Keowee Turbine Sump Pump System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Pump Casing (AC)	Pressure Boundary
Pump Casing (AC spare)	Structural Integrity
Pump Casing (DC)	Pressure Boundary
Strainer Body	Pressure Boundary
Strainer Screen	Filtration

Table 2.3.3.7-8 Keowee Turbine Sump Pump System

Component/Commodity Group	Intended Functions
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-40, Auxiliary Systems - Keowee Turbine Sump Pump System - Aging Management Evaluation.

2.3.3.7.9 Vacuum System

System Description

The main vacuum system uses vacuum pumps and condensate steam air ejectors to evacuate air and non-condensible gases from the main condenser, main turbine casing, and the upper surge tank during start up and normal operations.

System Intended Functions

Portions of the vacuum system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Non-safety related components of the vacuum system are relied upon to break vacuum in condenser hotwell "C" to allow suction for emergency feedwater pumps. Portions of the vacuum system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the vacuum system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the vacuum system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the vacuum system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the vacuum system can be found in UFSAR Sections 9.2.2.1, 10.4.2 and Figure 10-5.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the vacuum system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-121C-1.1
- OSLRD-121C-1.2
- OSLRD-121C-1.3
- OSLRD-121C-1.4
- OSLRD-121C-2.1
- OSLRD-121C-2.2
- OSLRD-121C-2.3
- OSLRD-121C-3.1
- OSLRD-121C-3.2
- OSLRD-121C-3.3

Secondary Drawings

- OSLRD-121A-1.6
- OSLRD-121A-2.6
- OSLRD-121A-3.6
- OSLRD-133A-1.2
- OSLRD-133A-3.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.7-9, Vacuum System.

Table 2.3.3.7-9 Vacuum System

Component/Commodity Group	Intended Functions
Air Dryer (vacuum)	Structural Integrity
Air Ejector (condensate steam)	Structural Integrity

Table 2.3.3.7-9 Vacuum System

Component/Commodity Group	Intended Functions
Air Ejector (emergency steam)	Structural Integrity
Blower Casing (condensate steam air ejector)	Structural Integrity
Bolting	Pressure Boundary Structural Integrity
Expansion Joint	Structural Integrity
Filter Body	Structural Integrity
Moisture Separator (condensate steam air ejector blower)	Structural Integrity
Moisture Separator (RIA-40)	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Structural Integrity
Pump Casing (continuous priming vacuum)	Structural Integrity
Pump Casing (main vacuum)	Structural Integrity
Sight Glass	Structural Integrity
Silencer	Structural Integrity
Tank (continuous priming vacuum)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-41, Auxiliary Systems - Vacuum System - Aging Management Evaluation.

2.3.3.8 Miscellaneous Oil Related Systems

2.3.3.8.1 Electro-Hydraulic Control System

System Description

The electro-hydraulic control system controls the high pressure turbine steam inlet stop and control valves, thereby, controlling operation of the high pressure turbine and effectively the downstream low pressure turbines. In addition to controlling the normal operation of the main turbine, the electro-hydraulic control system also develops signals for testing and for safeguards to protect the turbine.

System Intended Functions

Portions of the electro-hydraulic control system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the electro-hydraulic control system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the electro-hydraulic control system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the electro-hydraulic control system are relied upon for compliance with regulations for SBO (10 CFR 50.63) and ATWS (10 CFR 50.62). Therefore, the electro-hydraulic control system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the electro-hydraulic control system can be found in UFSAR Sections 10.2.1 and 10.4.6.5.1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the electro-hydraulic control system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-135D-1.1
- OSLRD-135D-2.1
- OSLRD-135D-3.1

Secondary Drawings

- OSLRD-125A-1.2
- OSLRD-125A-2.1
- OSLRD-125A-3.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.8-1, Electro-Hydraulic Control System.

Table 2.3.3.8-1 Electro-Hydraulic Control System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Expansion Joint	Structural Integrity
Filter Body	Structural Integrity
Heat Exchanger (electro-hydraulic control cooler) Head	Structural Integrity
Heat Exchanger (electro-hydraulic control cooler) Shell	Structural Integrity
Piping	Structural Integrity
Pump Casing (electro-hydraulic control)	Structural Integrity
Pump Casing (transfer and filtering)	Structural Integrity

Table 2.3.3.8-1 Electro-Hydraulic Control System

Component/Commodity Group	Intended Functions
Sight Glass	Structural Integrity
Tank (nitrogen accumulators)	Structural Integrity
Tank (electro-hydraulic control reservoir)	Structural Integrity
Tank (recirculating)	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-42, Auxiliary Systems - Electro-Hydraulic Control System - Aging Management Evaluation.

2.3.3.8.2 Fuel Oil System

System Description

The fuel oil system supplies adequate fuel oil from two oil tanks to the auxiliary boiler burners for combustion. The auxiliary boiler is used to supply steam for unit startup operations if auxiliary steam from another unit is unavailable.

System Intended Functions

Portions of the fuel oil system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the fuel oil system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the fuel oil system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the fuel oil system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the fuel oil system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-135A-1.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.8-2, Fuel Oil System.

Table 2.3.3.8-2 Fuel Oil System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Flexible Connection	Structural Integrity
Piping	Structural Integrity
Pulsation Dampener	Structural Integrity
Pump Casing (auxiliary boiler fuel oil supply)	Structural Integrity
Pump Casing (waste oil metering)	Structural Integrity

Table 2.3.3.8-2 Fuel Oil System

Component/Commodity Group	Intended Functions
Sight Glass	Structural Integrity
Strainer Body	Structural Integrity
Tank (WOCOS pump supply)	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-43, Auxiliary Systems - Fuel Oil System - Aging Management Evaluation.

2.3.3.8.3 Keowee Generator High Pressure Oil System

System Description

The Keowee generator high pressure oil system is a lift system which provides a positive oil film between the generator thrust bearing shoes and the runner during starting and stopping to minimize wear and improve reliability. The oil is drawn from the oil reservoir, circulated under pressure through an oil filter and supplied to each thrust bearing shoe.

System Intended Functions

Portions of the Keowee generator high pressure oil system are relied upon to provide high pressure oil to the generator thrust bearing during starts and stops. Therefore, the Keowee generator high pressure oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the Keowee generator high pressure oil system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee generator high pressure oil system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee generator high pressure oil system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the Keowee generator high pressure oil system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the Keowee generator high pressure oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

No additional details of the Keowee generator high pressure oil system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee generator high pressure oil system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- KSLRD-103A-1.1
- KSLRD-103A-2.1

Secondary Drawings

- KSLRD-100A-1.1
- KSLRD-100A-2.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.8-3, Keowee Generator High Pressure Oil System.

Table 2.3.3.8-3 Keowee Generator High Pressure Oil System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Filter Body	Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Pump Casing (AC generator high pressure oil)	Pressure Boundary
Pump Casing (DC generator high pressure oil)	Pressure Boundary
Tank (generator thrust and guide bearings)	Pressure Boundary
Valve Body	Pressure Boundary

The AMR results for these component types are indicated in Table 3.3.2-44, Auxiliary Systems - Keowee Generator High Pressure Oil System - Aging Management Evaluation.

2.3.3.8.4 Keowee Governor Oil System

System Description

The Keowee governor oil system provides sufficient hydraulic pressure to open and close the wicket gates on governor demand. The wicket gates control rate of flow of water through the Keowee turbines. During system operation, pressurized oil is supplied to the governor actuator which in turn feeds the servomotors which control movement of the wicket gates. The system is required for operation to supply emergency power generator for the Oconee plant as well as normal power generation for the system grid.

System Intended Functions

Portions of the Keowee governor oil system provide sufficient governor oil pressure to control the turbine. Therefore, the Keowee governor oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the Keowee governor oil system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee governor oil system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee governor oil system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the Keowee governor oil system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the Keowee governor oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the Keowee governor oil system can be found in UFSAR Section 3.1.1.1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee governor oil system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- KSLRD-105A-1.1
- KSLRD-105A-2.1

Secondary Drawings

- KSLRD-106A-3.0

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.8-4, Keowee Governor Oil System.

Table 2.3.3.8-4 Keowee Governor Oil System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Flexible Connections	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Pump Casing (governor oil A, B, C)	Pressure Boundary
Sight Glass	Pressure Boundary
Tank (governor oil pressure)	Pressure Boundary
Tank (governor oil sump)	Pressure Boundary
Valve Body	Pressure Boundary

The AMR results for these component types are indicated in Table 3.3.2-45, Auxiliary Systems - Keowee Governor Oil System - Aging Management Evaluation.

2.3.3.8.5 Refueling System

System Description

The refueling system consists of those components designed specifically for the process of receiving new (non-irradiated) nuclear fuel and transferring new and spent (irradiated) fuel between the reactor vessel and the spent fuel pool.

Separate fuel handling equipment is provided for each reactor. A common fuel storage area serves Units 1 and 2, while a separate fuel storage area is provided for Unit 3.

System Intended Functions

Portions of the refueling system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the refueling system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the refueling system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

Additional details of the refueling system can be found in UFSAR Sections 9.1.4.1.1 and 9.1.4.1.4.

System Evaluation Boundary

The SLR evaluation boundaries of the refueling system include only those components associated with the hydraulic refueling equipment that are not depicted on system evaluation boundary drawings. Therefore, no system evaluation boundary drawings are provided for the refueling system.

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.8-5, Refueling System.

Table 2.3.3.8-5 Refueling System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Flexible Connection	Structural Integrity
Filter Body	Structural Integrity
Piping	Structural Integrity
Pump Casing (hydraulic power unit)	Structural Integrity
Sight Glass	Structural Integrity
Tank (hydraulic power unit)	Structural Integrity

Table 2.3.3.8-5 Refueling System

Component/Commodity Group	Intended Functions
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-46, Auxiliary Systems - Refueling System - Aging Management Evaluation.

2.3.3.8.6 Hydrogen Seal Oil System

System Description

The hydrogen seal oil system prevents leakage of hydrogen from the main generator interior. A floating, radial ring type seal is used to prevent hydrogen leakage from the main generator along the shaft. Oil is supplied to the seals at a pressure slightly higher than that of the hydrogen in the generator.

System Intended Functions

Portions of the hydrogen seal oil system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the hydrogen seal oil system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the hydrogen seal oil system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

UFSAR References

No additional details of the hydrogen seal oil system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the hydrogen seal oil system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-135C-1.1
- OSLRD-135C-2.1
- OSLRD-135C-3.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.8-6, Hydrogen Seal Oil System.

Table 2.3.3.8-6 Hydrogen Seal Oil System

Component/Commodity Group	Intended Functions
Bolting	Structural Integrity
Filter Body	Structural Integrity
Piping	Structural Integrity
Pump Casing (emergency seal oil)	Structural Integrity
Pump Casing (main seal oil)	Structural Integrity
Pump Casing (recirculating seal oil)	Structural Integrity
Pump Casing (seal oil vacuum)	Structural Integrity
Sight Glass	Structural Integrity

Table 2.3.3.8-6 Hydrogen Seal Oil System

Component/Commodity Group	Intended Functions
Tank (seal oil separator)	Structural Integrity
Tank (seal oil vacuum)	Structural Integrity
Trap Body	Structural Integrity
Valve Body	Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-47, Auxiliary Systems - Hydrogen Seal Oil System - Aging Management Evaluation.

2.3.3.9 Raw Water Related Systems

2.3.3.9.1 Condenser Circulating Water System

System Description

The condenser circulating water system utilizes lake water that serves as the ultimate heat sink during normal operation and for decay heat removal during plant cooldown. This system also provides cooling water to various plant equipment and is the suction source for other service water systems, including the high pressure service water, low pressure service water, and protected service water. The condenser circulating water system is capable of providing sufficient flow to meet emergency cooling requirements through unassisted siphon flow if the system pumps are lost. The standby shutdown facility auxiliary service water system, turbine building sumps system, and standby shutdown facility sump system are evaluated with the condenser circulating water system. The standby shutdown facility auxiliary service water system is designed to provide decay heat removal by supplying cooling water to the steam generators if normal and emergency feedwater cooling of the steam generators are lost. The turbine building sumps system is designed to process radioactively contaminated water from the turbine building sump. The standby shutdown facility sump system discharges water collected from floor drains located in the standby shutdown facility to the yard drain system for release.

System Intended Functions

Portions of the condenser circulating water system are relied on to provide a suction source for the low pressure service water system and standby shutdown facility auxiliary service water system during emergency operations. The standby shutdown facility auxiliary service water subsystem provides steam generator secondary side cooling and cooling water to support standby shutdown facility operations. Therefore, the condenser circulating water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the condenser circulating water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Non-safety related components of the condenser circulating water system provide the suction source required for control, cable and equipment room cooling and prevent backflow of water from the yard drain system to the standby shutdown facility pump room during a turbine building flood event. Portions of the condenser circulating water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/ or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the condenser circulating water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the condenser circulating water system are relied upon for compliance with regulations for EQ (10 CFR 50.49), Fire Protection (10 CFR 50.48), and SBO (10 CFR 50.63). Therefore, the condenser circulating water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the condenser circulating water system can be found in UFSAR Sections 9.2.2 and 9.6.3.3.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the condenser circulating water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-133A-1.1
- OSLRD-133A-1.2
- OSLRD-133A-1.3
- OSLRD-133A-1.4
- OSLRD-133A-1.5
- OSLRD-133A-1.6
- OSLRD-133A-2.1
- OSLRD-133A-2.2
- OSLRD-133A-2.3
- OSLRD-133A-2.4
- OSLRD-133A-2.5
- OSLRD-133A-3.1
- OSLRD-133A-3.2
- OSLRD-133A-3.3
- OSLRD-133A-3.4
- OSLRD-133A-3.5

Secondary Drawings

- OSLRD-121C-1.1
- OSLRD-121C-2.1
- OSLRD-121C-3.1
- OSLRD-124A-1.2
- OSLRD-124C-1.2
- OSLRD-124C-2.2
- OSLRD-124C-3.2
- OSLRD-129A-1.2
- OSLRD-129A-2.2
- OSLRD-129A-3.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.9-1, Condenser Circulating Water System.

Table 2.3.3.9-1 Condenser Circulating Water System

Component/Commodity Group	Intended Functions
Air Ejector	Pressure Boundary
Bolting	Pressure Boundary Structural Integrity
Expansion Joint	Pressure Boundary Structural Integrity
Flexible Connection	Pressure Boundary Structural Integrity
Flow Element	Flow Restriction Pressure Boundary Structural Integrity
Heat Exchanger (standby shutdown facility heating, ventilation, and air conditioning condenser) Head	Pressure Boundary
Heat Exchanger (standby shutdown facility heating, ventilation, and air conditioning condenser) Shell	Pressure Boundary

Table 2.3.3.9-1 Condenser Circulating Water System

Component/Commodity Group	Intended Functions
Heat Exchanger (standby shutdown facility heating, ventilation, and air conditioning condenser) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (standby shutdown facility heating, ventilation, and air conditioning condenser) Tubesheet	Pressure Boundary
Orifice	Flow Restriction Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Structural Integrity
Pump Casing (chiller service water)	Structural Integrity
Pump Casing (condenser circulating water booster)	Pressure Boundary
Pump Casing (condenser circulating water intake)	Pressure Boundary
Pump Casing (emergency feedwater pump turbine oil cooler)	Pressure Boundary
Pump Casing (recirculating)	Structural Integrity
Pump Casing (standby shutdown facility auxiliary service water)	Pressure Boundary
Pump Casing (standby shutdown facility building sump)	Structural Integrity
Pump Casing (standby shutdown facility diesel engine service water)	Pressure Boundary
Pump Casing (standby shutdown facility heating, ventilation, and air conditioning service water)	Pressure Boundary
Pump Casing (submersible)	Pressure Boundary

Table 2.3.3.9-1 Condenser Circulating Water System

Component/Commodity Group	Intended Functions
Pump Casing (unwatering)	Structural Integrity
Strainer Body	Pressure Boundary Structural Integrity
Strainer Screen	Filtration
Tank (ball collector)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-48, Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation.

2.3.3.9.2 Low Pressure Service Water System

System Description

The low pressure service water system provides cooling water to a variety of safety related components in the plant, including the reactor building cooling units, low pressure injection coolers, high pressure injection pump motor bearing coolers, the siphon seal water system, A and B chiller condensers, and motor driven emergency feedwater pump motor air coolers. The low pressure service water system also provides a source of water to non-safety related systems and components in the plant for cooling, sealing, inventory makeup, fire protection, backwash and flush.

System Intended Functions

Portions of the low pressure service water system are relied upon to maintain containment integrity. Portions of the low pressure service water system are also relied upon to supply cooling water to the reactor building cooling units, low pressure injection coolers, high pressure injection pump motor bearing coolers, motor driven emergency feedwater pump motor, reactor coolant pump motor, siphon seal water system, and the A and B chiller condensers. Therefore, the low pressure service water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the low pressure service water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the low pressure service water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the low pressure service water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the low pressure service water system are relied upon for compliance with regulations for EQ (10 CFR 50.49) and Fire Protection (10 CFR 50.48). Therefore, the low pressure service water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the low pressure service water system can be found in UFSAR Section 9.2.2.2.3.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the low pressure service water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-124A-1.1
- OSLRD-124A-1.2
- OSLRD-124A-1.3
- OSLRD-124A-2.2
- OSLRD-124A-2.3
- OSLRD-124A-3.1
- OSLRD-124A-3.2
- OSLRD-124A-3.3
- OSLRD-124B-1.1

- OSLRD-124B-1.2
- OSLRD-124B-1.3
- OSLRD-124B-1.4
- OSLRD-124B-1.5
- OSLRD-124B-1.6
- OSLRD-124B-1.7
- OSLRD-124B-2.1
- OSLRD-124B-2.2
- OSLRD-124B-2.3
- OSLRD-124B-2.4
- OSLRD-124B-3.1
- OSLRD-124B-3.2
- OSLRD-124B-3.3
- OSLRD-124B-3.4
- OSLRD-124B-3.5
- OSLRD-124B-3.6
- OSLRD-124B-3.7

Secondary Drawings

- OSLRD-107M-1.2
- OSLRD-121A-1.5
- OSLRD-121A-3.5
- OSLRD-124C-1.2
- OSLRD-124C-2.2
- OSLRD-124C-3.2
- OSLRD-125A-1.5
- OSLRD-131A-1.2
- OSLRD-131A-2.2
- OSLRD-131A-3.2
- OSLRD-133A-1.1
- OSLRD-133A-1.3
- OSLRD-133A-1.4
- OSLRD-133A-2.3
- OSLRD-133A-3.3

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.9-2, Low Pressure Service Water System.

Table 2.3.3.9-2 Low Pressure Service Water System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity

Table 2.3.3.9-2 Low Pressure Service Water System

Component/Commodity Group	Intended Functions
Expansion Joint	Pressure Boundary
Filter Body	Pressure Boundary
Filter Screen	Filtration
Flexible Connection	Pressure Boundary Structural Integrity
Flow Element	Flow Restriction Pressure Boundary Structural Integrity
Hose (stored equipment)	Pressure Boundary
Nozzle	Structural Integrity
Orifice	Flow Restriction Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Piping (stored equipment)	Pressure Boundary
Pump Casing (chiller condenser service water)	Pressure Boundary
Pump Casing (low pressure service water)	Pressure Boundary
Sight Glass	Structural Integrity
Strainer Body	Pressure Boundary Structural Integrity

Table 2.3.3.9-2 Low Pressure Service Water System

Component/Commodity Group	Intended Functions
Strainer Screen	Filtration
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-49, Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation.

2.3.3.9.3 Protected Service Water System

System Description

The protected service water system is a standby system for use under emergency conditions which provides added “defense-in-depth” protection serving as a backup to existing safety systems. Protected service water system is not relied upon during design basis events. It is relied upon for decay heat removal and to support high pressure injection during fire scenarios.

System Intended Functions

Portions of the protected service water system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the protected service water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the protected service water system can be found in UFSAR Section 9.7.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the protected service water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-131A-1.1
- OSLRD-131A-1.2
- OSLRD-131A-2.2
- OSLRD-131A-3.2

Secondary Drawings

- OSLRD-133A-2.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.9-3, Protected Service Water System.

Table 2.3.3.9-3 Protected Service Water System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Filter Body	Pressure Boundary
Filter Screen	Filtration
Flow Element	Flow Restriction Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Piping (stored equipment)	Pressure Boundary

Table 2.3.3.9-3 Protected Service Water System

Component/Commodity Group	Intended Functions
Pump Casing (portable)	Pressure Boundary
Pump Casing (protected service water booster)	Pressure Boundary
Pump Casing (protected service water primary)	Pressure Boundary
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-50, Auxiliary Systems - Protected Service Water System - Aging Management Evaluation.

2.3.3.9.4 Siphon Seal Water System

System Description

The siphon seal water system is designed to support the essential siphon vacuum system by providing operating liquid to the essential siphon vacuum pumps. The siphon seal water system also supports the condenser circulating water system by providing sealing and cooling water to the condenser circulating water system pumps and motors.

System Intended Functions

Portions of the siphon seal water system are relied upon to supply seal water to support operation of the essential siphon vacuum pumps during and following design basis events. Therefore, the siphon seal water system in within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the siphon seal water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the siphon seal water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the siphon seal water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the siphon seal water system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the siphon seal water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the siphon seal water system can be found in UFSAR Section 9.2.2.2.5.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the siphon seal water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-129A-1.1
- OSLRD-129A-1.2
- OSLRD-129A-2.2
- OSLRD-129A-3.2

Secondary Drawings

- OSLRD-124A-1.1
- OSLRD-124A-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.9-4, Siphon Seal Water System.

Table 2.3.3.9-4 Siphon Seal Water System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Flow Element	Flow Restriction Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Strainer Body	Pressure Boundary
Strainer Screen	Filtration
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-51, Auxiliary Systems - Siphon Seal Water System - Aging Management Evaluation.

2.3.3.9.5 Keowee Turbine Generator Cooling Water System

System Description

The Keowee turbine generator cooling water system provides cooling water to the turbine packing box, generator thrust bearing coolers, generator air coolers, and turbine guide bearing oil coolers. It also provides a backup supply of cooling water to the governor air aftercooler. The Keowee turbine generator cooling water system is supplied from the penstock where gravity flow supplies the loads in the system and is discharged to Lake Hartwell. Operation of the Keowee turbine generator cooling water is required during all unit modes of Keowee operation.

System Intended Functions

Portions of the Keowee turbine generator cooling water system are relied upon to provide cooling water for the Keowee turbines and generators during emergency power generation. Therefore, the Keowee turbine generator cooling water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the Keowee turbine generator cooling water system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee turbine generator cooling water system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the Keowee turbine generator cooling water system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the Keowee turbine generator cooling water system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the Keowee turbine generator cooling water system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

No additional details of the Keowee turbine generator cooling water system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the Keowee turbine generator cooling water system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- KSLRD-100A-1.1
- KSLRD-100A-2.1

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.9-5, Keowee Turbine Generator Cooling Water System.

Table 2.3.3.9-5 Keowee Turbine Generator Cooling Water System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Flow Element	Flow Restriction Pressure Boundary
Heat Exchanger (generator air cooler) Fins	Heat Transfer
Heat Exchanger (generator air cooler) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (generator air cooler) Tubesheet	Pressure Boundary
Heat Exchanger (generator air cooler) Waterbox	Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Strainer Body	Pressure Boundary
Strainer Screen	Filtration

Table 2.3.3.9-5 Keowee Turbine Generator Cooling Water System

Component/Commodity Group	Intended Functions
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-52, Auxiliary Systems - Keowee Turbine Generator Cooling Water System - Aging Management Evaluation.

2.3.3.10 Standby Shutdown Facility Diesel Generator Related Systems

2.3.3.10.1 Standby Shutdown Facility Air Intake and Exhaust System

System Description

The standby shutdown facility air intake and exhaust system provides combustion air for the standby shutdown facility diesel engines and removes exhaust gases from the engines.

System Intended Functions

Portions of the standby shutdown facility air intake and exhaust system are relied upon to provide an air intake and exhaust for the standby shutdown facility diesel engines. Therefore, the standby shutdown facility air intake and exhaust system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the standby shutdown facility air intake and exhaust system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the standby shutdown facility air intake and exhaust system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the standby shutdown facility air intake and exhaust system can be found in UFSAR Figure 9-30.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the standby shutdown facility air intake and exhaust system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-137D-1.3

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.10-1, Standby Shutdown Facility Air Intake and Exhaust System.

Table 2.3.3.10-1 Standby Shutdown Facility Air Intake and Exhaust System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary
Expansion Joint	Pressure Boundary
Flexible Connection	Pressure Boundary
Insulation	Thermal Resistance
Muffler (exhaust silencer)	Pressure Boundary
Muffler (intake filter/silencer)	Pressure Boundary
Piping (exhaust)	Pressure Boundary
Piping (intake)	Pressure Boundary
Piping and Piping Components	Pressure Boundary
Screen (exhaust)	Filtration
Screen (intake)	Filtration

The AMR results for these component types are indicated in Table 3.3.2-53, Auxiliary Systems - Standby Shutdown Facility Air Intake and Exhaust System - Aging Management Evaluation.

2.3.3.10.2 Standby Shutdown Facility Diesel Engine System

System Description

The standby shutdown facility diesel engine system consists of two diesel engines (one with 16 cylinders, and the other with 12 cylinders) connected in tandem, jointly driving a generator located between them. The diesel engines are “V” type, two-cycle, turbocharged, positive scavenging air, solid unit injection, and high compression type. The generator is a two-bearing cradle type, horizontal, AC synchronous generator, non-self-exciting type, and has double shaft extensions for the tandem drive.

System Intended Functions

Portions of the standby shutdown facility diesel engine system are relied upon to provide motive power to supply the standby shutdown facility emergency generator during an event which requires operation of either the standby shutdown facility auxiliary service water system or the reactor coolant makeup system. Therefore, the standby shutdown facility diesel engine system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the standby shutdown facility diesel engine system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the standby shutdown facility diesel engine system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the standby shutdown facility diesel engine system can be found in UFSAR Section 9.6.3.4.2 and Figure 9-30.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the standby shutdown facility diesel engine system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- None

Secondary Drawings

- OSLRD-135A-1.2
- OSLRD-135B-1.4
- OSLRD-137D-1.3
- OSLRD-138A-1.1

Components Subject to Aging Management Review

The standby shutdown facility diesel engine system includes only the diesel engines which are active components per 10 CFR 54.21(a)(1)(i) and not subject to AMR.

2.3.3.10.3 Standby Shutdown Facility Diesel Jacket Water Cooling System

System Description

The standby shutdown facility diesel jacket water cooling system removes heat from the standby shutdown facility diesel engines when the engines are operating and maintains the engines at standby temperatures when the engines are not operating.

System Intended Functions

Portions of the standby shutdown facility diesel jacket water cooling system are relied upon to provide jacket cooling and lube oil cooling for the standby shutdown facility diesel generator. Therefore, the standby shutdown facility diesel jacket water cooling system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the standby shutdown facility diesel jacket water cooling system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the standby shutdown facility diesel jacket water cooling system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the standby shutdown facility diesel jacket water cooling system can be found in UFSAR Section 9.6.3.4.2 and Figure 9-37.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the standby shutdown facility diesel jacket water cooling system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-138A-1.1

Secondary Drawings

- OSLRD-133A-2.5

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.10-3, Standby Shutdown Facility Diesel Jacket Water Cooling System.

Table 2.3.3.10-3 Standby Shutdown Facility Diesel Jacket Water Cooling System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary

Table 2.3.3.10-3 Standby Shutdown Facility Diesel Jacket Water Cooling System

Component/Commodity Group	Intended Functions
Flexible Connection	Pressure Boundary
Heat Exchanger (jacket water) Head	Pressure Boundary
Heat Exchanger (jacket water) Shell	Pressure Boundary
Heat Exchanger (jacket water) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (jacket water) Tubesheet	Pressure Boundary
Heater Casing (immersion heater)	Pressure Boundary
Piping	Pressure Boundary
Pump Casing (engine driven)	Pressure Boundary
Sight Glass	Pressure Boundary
Tank (expansion)	Pressure Boundary
Valve Body	Pressure Boundary

The AMR results for these component types are indicated in Table 3.3.2-54, Auxiliary Systems - Standby Shutdown Facility Diesel Jacket Water Cooling System - Aging Management Evaluation.

2.3.3.10.4 Standby Shutdown Facility Diesel Lube Oil System

System Description

The standby shutdown facility diesel lube oil system provides lubrication and cooling of the standby shutdown facility diesel engine bearings, gears, turbocharger bearings, and provides cooling of the diesel engine pistons.

System Intended Functions

Portions of the standby shutdown facility diesel lube oil system are relied upon to provide lube oil supply to the standby shutdown facility diesel engines. Therefore, the standby shutdown facility diesel lube oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the standby shutdown facility diesel lube oil system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the standby shutdown facility diesel lube oil system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the standby shutdown facility diesel lube oil system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the standby shutdown facility diesel lube oil system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the standby shutdown facility diesel lube oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the standby shutdown facility diesel lube oil system can be found in UFSAR Section 9.6.3.4.2.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the standby shutdown facility diesel lube oil system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-135B-1.4

Secondary Drawings

- OSLRD-138A-1.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.10-4, Standby Shutdown Facility Diesel Lube Oil System.

Table 2.3.3.10-4 Standby Shutdown Facility Diesel Lube Oil System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary
Filter Body	Pressure Boundary
Flexible Connection	Pressure Boundary
Heat Exchanger (lube oil) Head	Pressure Boundary
Heat Exchanger (lube oil) Shell	Pressure Boundary
Heat Exchanger (lube oil) Tubes	Heat Transfer Pressure Boundary
Heat Exchanger (lube oil) Tubesheet	Pressure Boundary
Orifice	Flow Restriction Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity

Table 2.3.3.10-4 Standby Shutdown Facility Diesel Lube Oil System

Component/Commodity Group	Intended Functions
Pump Casing (circulating)	Pressure Boundary
Pump Casing (DC backup)	Pressure Boundary
Pump Casing (main bearing)	Pressure Boundary
Pump Casing (piston cooling)	Pressure Boundary
Pump Casing (scavenging)	Pressure Boundary
Sight Glass	Pressure Boundary
Strainer Body	Pressure Boundary
Strainer Screen	Filtration
Tank (diesel engine oil sump)	Pressure Boundary
Valve Body	Pressure Boundary

The AMR results for these component types are indicated in Table 3.3.2-55, Auxiliary Systems - Standby Shutdown Facility Diesel Lube Oil System - Aging Management Evaluation.

2.3.3.10.5 Standby Shutdown Facility Fuel Oil System

System Description

The standby shutdown facility fuel oil system supplies adequate fuel oil to each of the standby shutdown facility diesel engine fuel injectors for combustion and injector cooling. Excess fuel oil from the injector cooling is returned to the fuel oil day tank which serves as a heat sink for the standby shutdown facility fuel oil system. Fuel oil to the day tank is supplied from the underground fuel oil storage tank.

System Intended Functions

Portions of the standby shutdown facility fuel oil system are relied upon to provide fuel oil supply to the standby shutdown facility diesel engines. Therefore, the standby shutdown facility fuel oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the standby shutdown facility fuel oil system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the standby shutdown facility fuel oil system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the standby shutdown facility fuel oil system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the standby shutdown facility fuel oil system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the standby shutdown facility fuel oil system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the standby shutdown facility fuel oil system can be found in UFSAR Section 9.6.3.4.2 and Figure 9-30.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the standby shutdown facility fuel oil system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-135A-1.2

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.10-5, Standby Shutdown Facility Fuel Oil System.

Table 2.3.3.10-5 Standby Shutdown Facility Fuel Oil System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Filter Body	Pressure Boundary Structural Integrity
Flexible Connection	Pressure Boundary
Flow Element	Flow Restriction Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Pump Casing (DC driven)	Pressure Boundary
Pump Casing (engine driven)	Pressure Boundary
Pump Casing (fuel oil recirculation)	Structural Integrity
Pump Casing (fuel oil transfer)	Pressure Boundary
Strainer Body	Pressure Boundary
Strainer Screen	Filtration
Tank (diesel engine fuel oil storage)	Pressure Boundary
Tank (fuel oil day)	Pressure Boundary

Table 2.3.3.10-5 Standby Shutdown Facility Fuel Oil System

Component/Commodity Group	Intended Functions
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-56, Auxiliary Systems - Standby Shutdown Facility Fuel Oil System - Aging Management Evaluation.

2.3.3.10.6 Standby Shutdown Facility Governor System

System Description

The standby shutdown facility governor system provides speed control for the standby shutdown facility diesel engines. An electro hydraulic governor with an integral backup mechanical hydraulic governor is provided on each diesel engine.

System Intended Functions

Portions of the standby shutdown facility governor system are relied upon to provide speed control for the standby shutdown facility diesel engines. Therefore, the standby shutdown facility governor system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the standby shutdown facility governor system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the standby shutdown facility governor system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

No additional details of the standby shutdown facility governor system can be found in the UFSAR.

System Evaluation Boundary

The standby shutdown facility governor system is part of the vendor-supplied standby shutdown facility diesel engine. Therefore, no SLR diagrams are provided for this system.

Components Subject to Aging Management Review

The standby shutdown facility governor system includes only the governors which are active components included within the evaluation boundaries of the standby shutdown facility diesel engines and not subject to AMR per 10 CFR 54.21(a)(1)(i).

2.3.3.10.7 Standby Shutdown Facility Starting Air System

System Description

The standby shutdown facility starting air system provides compressed air to start the standby shutdown facility diesel engines.

System Intended Functions

Portions of the standby shutdown facility starting air system are relied upon to provide starting air for the standby shutdown facility diesel engines. Therefore, the standby shutdown facility starting air system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the standby shutdown facility starting air system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the standby shutdown facility starting air system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the standby shutdown facility starting air system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the standby shutdown facility starting air system are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the standby shutdown facility starting air system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the standby shutdown facility starting air system can be found in UFSAR Section 9.6.3.4.2 and Figure 9-38.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the standby shutdown facility starting air system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-137D-1.1
- OSLRD-137D-1.2

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.10-7, Standby Shutdown Facility Starting Air System.

Table 2.3.3.10-7 Standby Shutdown Facility Starting Air System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Compressor (starting air)	Structural Integrity
Filter Body	Structural Integrity
Flexible Connection	Pressure Boundary
Heat Exchanger (aftercooler) Head	Structural Integrity
Heat Exchanger (aftercooler) Tubes	Structural Integrity
Lubricator Body	Pressure Boundary

Table 2.3.3.10-7 Standby Shutdown Facility Starting Air System

Component/Commodity Group	Intended Functions
Piping	Pressure Boundary Structural Integrity
Strainer Body	Pressure Boundary
Strainer Screen	Filtration
Tank (air dryer)	Structural Integrity
Tank (air receiver)	Pressure Boundary
Tank (moisture separator)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-57, Auxiliary Systems - Standby Shutdown Facility Starting Air System - Aging Management Evaluation.

2.3.3.11 Waste Disposal Related Systems

2.3.3.11.1 Gaseous Waste Disposal System

System Description

The gaseous waste disposal system is designed to collect, hold-up, and process potentially radioactive gaseous waste generated in the plant. The system controls and minimizes releases of radioactivity to the environment by collecting potentially radioactive gases vented from various components in the reactor building and auxiliary building.

System Intended Functions

Portions of the gaseous waste disposal system are relied upon to maintain containment integrity. Therefore, the gaseous waste disposal system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the gaseous waste disposal system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the gaseous waste disposal system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the gaseous waste disposal system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the gaseous waste disposal system are relied upon for compliance with regulations for EQ (10 CFR 50.49). Therefore, the gaseous waste disposal system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the gaseous waste disposal system can be found in UFSAR Sections 1.2.2.9, 11.3 and Figure 11-3.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the gaseous waste disposal system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-108A-1.1
- OSLRD-108A-1.2
- OSLRD-108A-1.3
- OSLRD-108A-3.1
- OSLRD-108A-3.2
- OSLRD-108A-3.3
- OSLRD-108A-3.4

Secondary Drawings

- OSLRD-107A-1.1
- OSLRD-107A-2.1
- OSLRD-107A-3.1
- OSLRD-125A-1.4
- OSLRD-125A-3.4

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.11-1, Gaseous Waste Disposal System.

Table 2.3.3.11-1 Gaseous Waste Disposal System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Fan (gaseous waste disposal exhauster) Housing	Structural Integrity
Filter Housing	Structural Integrity
Flexible Connection	Structural Integrity

Table 2.3.3.11-1 Gaseous Waste Disposal System

Component/Commodity Group	Intended Functions
Heat Exchanger (gaseous waste disposal compressor seal water cooler) Head	Structural Integrity
Heat Exchanger (gaseous waste disposal compressor seal water cooler) Shell	Structural Integrity
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary
Sight Glass	Structural Integrity
Strainer Body	Structural Integrity
Tank (gaseous waste disposal decay)	Structural Integrity
Tank (gaseous waste disposal separator)	Structural Integrity
Trap Body	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-58, Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation.

2.3.3.11.2 Liquid Waste Disposal System

System Description

The liquid waste disposal system is a normally operating system designed to collect, sample, holdup for decay, evaporate, reclaim, reprocess or discharge all liquid waste generated at Oconee. The purpose of the system is to control and minimize releases of radioactivity to the environment.

System Intended Functions

Portions of the liquid waste disposal system are relied upon to maintain containment integrity. The liquid waste disposal system provides a flow path from letdown storage tank to reactor building emergency sump for LOCA mitigation. Therefore, the liquid waste disposal system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the liquid waste disposal system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the liquid waste disposal system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the liquid waste disposal system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the liquid waste disposal system are relied upon for compliance with regulations for EQ (10 CFR 50.49). Therefore, the liquid waste disposal system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the liquid waste disposal system can be found in UFSAR Sections 1.2.2.9, 11.2 and Figure 11-2.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the liquid waste disposal system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-107B-1.1
- OSLRD-107B-1.2
- OSLRD-107B-1.3
- OSLRD-107B-2.1
- OSLRD-107B-2.2
- OSLRD-107B-3.1
- OSLRD-107B-3.2
- OSLRD-107B-3.3
- OSLRD-107C-1.1
- OSLRD-107C-1.2
- OSLRD-107C-3.1
- OSLRD-107C-3.2
- OSLRD-107D-1.1
- OSLRD-107D-1.2
- OSLRD-107D-1.3
- OSLRD-107D-2.2
- OSLRD-107D-3.1
- OSLRD-107D-3.2
- OSLRD-107E-1.1
- OSLRD-107E-1.2
- OSLRD-107F-1.1
- OSLRD-107F-3.1
- OSLRD-107G-1.1
- OSLRD-107H-1.3
- OSLRD-107M-1.1
- OSLRD-107M-1.2
- OSLRD-117B-1.5
- OSLRD-133A-3.6

Secondary Drawings

- OSLRD-100A-1.1
- OSLRD-100A-2.1
- OSLRD-100A-3.1
- OSLRD-101A-1.1
- OSLRD-101A-1.3
- OSLRD-101A-1.4
- OSLRD-101A-2.1
- OSLRD-101A-2.3
- OSLRD-101A-2.4
- OSLRD-101A-3.1
- OSLRD-101A-3.3
- OSLRD-101A-3.4

- OSLRD-102A-1.1
- OSLRD-102A-1.2
- OSLRD-102A-1.3
- OSLRD-102A-2.1
- OSLRD-102A-2.2
- OSLRD-102A-2.3
- OSLRD-102A-3.1
- OSLRD-102A-3.2
- OSLRD-102A-3.3
- OSLRD-103A-1.1
- OSLRD-103A-2.1
- OSLRD-103A-3.1
- OSLRD-104A-1.1
- OSLRD-104A-1.2
- OSLRD-104A-3.1
- OSLRD-104A-3.2
- OSLRD-106A-1.1
- OSLRD-106A-2.1
- OSLRD-106A-3.1
- OSLRD-106B-1.1
- OSLRD-106B-1.2
- OSLRD-106B-1.5
- OSLRD-107A-1.2
- OSLRD-107A-2.2
- OSLRD-107A-3.2
- OSLRD-108A-1.1
- OSLRD-108A-1.2
- OSLRD-108A-1.3
- OSLRD-108A-1.4
- OSLRD-108A-3.1
- OSLRD-108A-3.2
- OSLRD-108A-3.3
- OSLRD-108A-3.4
- OSLRD-109A-1.1
- OSLRD-109A-1.2
- OSLRD-109A-3.1
- OSLRD-109A-3.2
- OSLRD-110A-1.1
- OSLRD-110A-1.2
- OSLRD-110A-1.7
- OSLRD-110A-2.1
- OSLRD-110A-2.2
- OSLRD-110A-3.1
- OSLRD-110A-3.2
- OSLRD-110A-3.7
- OSLRD-116A-1.1
- OSLRD-116A-2.1
- OSLRD-116A-3.1

- OSLRD-121A-1.5
- OSLRD-124B-1.1
- OSLRD-124B-1.4
- OSLRD-124B-2.1
- OSLRD-124B-2.4
- OSLRD-124B-3.1
- OSLRD-124B-3.4
- OSLRD-125A-3.4
- OSLRD-144A-1.1
- OSLRD-144A-2.1
- OSLRD-144A-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.3.11-2, Liquid Waste Disposal System.

Table 2.3.3.11-2 Liquid Waste Disposal System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Filter Body	Structural Integrity
Filter Screen	Filtration
Flexible Connection	Structural Integrity
Flow Element	Structural Integrity
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping And Piping Components	Pressure Boundary Structural Integrity
Pump Casing (condensate test tank waste discharge)	Structural Integrity
Pump Casing (laundry and hot shower)	Structural Integrity

Table 2.3.3.11-2 Liquid Waste Disposal System

Component/Commodity Group	Intended Functions
Pump Casing (miscellaneous waste transfer)	Structural Integrity
Pump Casing (reactor building normal sump)	Structural Integrity
Pump Casing (respirator washer drain transfer)	Structural Integrity
Pump Casing (spent resin sluicing)	Structural Integrity
Pump Casing (spent resin transfer)	Structural Integrity
Pump Casing (turbine building sump monitor tank drain)	Structural Integrity
Sight Glass	Structural Integrity
Strainer Body	Structural Integrity
Tank (laundry and hot shower)	Structural Integrity
Tank (miscellaneous waste holdup)	Structural Integrity
Tank (respirator washer drain)	Structural Integrity
Tank (spent resin storage)	Structural Integrity
Tank (Unit 3 high activity spent resin storage)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.3.2-59, Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation.

2.3.4 STEAM AND POWER CONVERSION SYSTEM

2.3.4.1 Condensate System

System Description

The condensate system delivers condensate from the condenser hotwells to the suction of the main feedwater pumps, purifies the condensate, removes non-condensible gases from the condensate, and heats the condensate to improve overall plant efficiency. The condensate system also supplies water to the emergency feedwater pumps during emergency operation.

System Intended Functions

The upper surge tank portion of the condensate system provides the primary source of emergency feedwater for the emergency feedwater pumps. Isolation of the upper surge tanks ensures minimum inventory for emergency feedwater. Therefore, the condensate system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the condensate system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the condensate system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the condensate system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the condensate system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the condensate system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the condensate system can be found in the UFSAR Section 10.4.6, Figure 10-6, and Table 10-1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the condensate system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-121A-1.1
- OSLRD-121A-1.2
- OSLRD-121A-1.3
- OSLRD-121A-1.4
- OSLRD-121A-1.5
- OSLRD-121A-1.6
- OSLRD-121A-1.7
- OSLRD-121A-1.8
- OSLRD-121A-1.9
- OSLRD-121A-1.10
- OSLRD-121A-2.1
- OSLRD-121A-2.2
- OSLRD-121A-2.3
- OSLRD-121A-2.4
- OSLRD-121A-2.5
- OSLRD-121A-2.6
- OSLRD-121A-2.7
- OSLRD-121A-2.8
- OSLRD-121A-2.9
- OSLRD-121A-2.10
- OSLRD-121A-3.1
- OSLRD-121A-3.2
- OSLRD-121A-3.3
- OSLRD-121A-3.4
- OSLRD-121A-3.5
- OSLRD-121A-3.6
- OSLRD-121A-3.7
- OSLRD-121A-3.8
- OSLRD-121A-3.9
- OSLRD-121A-3.10

Secondary Drawings

- OSLRD-107E-1.2
- OSLRD-110A-1.11
- OSLRD-110A-1.12
- OSLRD-110A-1.13
- OSLRD-110A-2.11
- OSLRD-110A-2.12
- OSLRD-110A-3.11
- OSLRD-110A-3.12
- OSLRD-121B-1.1
- OSLRD-121B-1.4
- OSLRD-121B-2.1
- OSLRD-121B-2.4
- OSLRD-121B-3.1
- OSLRD-121B-3.4
- OSLRD-121C-1.1
- OSLRD-121C-1.2
- OSLRD-121C-2.1
- OSLRD-121C-2.2
- OSLRD-121C-3.1
- OSLRD-121C-3.2
- OSLRD-122A-1.5
- OSLRD-122A-2.5
- OSLRD-122A-3.5
- OSLRD-122B-1.3
- OSLRD-122B-1.4
- OSLRD-122B-1.5
- OSLRD-122B-1.7
- OSLRD-122B-1.8
- OSLRD-122B-2.3
- OSLRD-122B-2.4
- OSLRD-122B-2.5
- OSLRD-122B-2.7
- OSLRD-122B-2.8
- OSLRD-122B-2.9
- OSLRD-122B-3.3
- OSLRD-122B-3.4
- OSLRD-122B-3.5
- OSLRD-122B-3.7
- OSLRD-122B-3.8
- OSLRD-122B-3.9
- OSLRD-123A-1.2
- OSLRD-123A-1.3
- OSLRD-123A-1.4
- OSLRD-123A-1.6
- OSLRD-123A-1.7
- OSLRD-123A-2.2

- OSLRD-123A-2.3
- OSLRD-123A-2.4
- OSLRD-123A-2.6
- OSLRD-123A-2.7
- OSLRD-123A-3.2
- OSLRD-123A-3.3
- OSLRD-123A-3.4
- OSLRD-123A-3.6
- OSLRD-123A-3.7
- OSLRD-125A-1.1
- OSLRD-125A-1.2
- OSLRD-125A-2.1
- OSLRD-125A-3.2
- OSLRD-128A-1.1
- OSLRD-128A-1.2
- OSLRD-128A-2.1
- OSLRD-128A-3.1
- OSLRD-133A-1.2
- OSLRD-133A-1.3
- OSLRD-133A-2.2
- OSLRD-133A-2.3
- OSLRD-133A-3.2
- OSLRD-133A-3.3
- OSLRD-135B-1.3
- OSLRD-135B-2.3
- OSLRD-135B-3.3
- OSLRD-148B-1.1
- OSLRD-148B-2.1
- OSLRD-148B-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-1, Condensate System.

Table 2.3.4-1 Condensate System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Boundary
Expansion Joint	Pressure Boundary Structural Integrity
Flexible Connection	Structural Integrity

Table 2.3.4-1 Condensate System

Component/Commodity Group	Intended Functions
Flow Element	Structural Integrity
Heat Exchanger (condensate booster pump oil cooler) Head	Structural Integrity
Heat Exchanger (condensate cooler) Head	Structural Integrity
Heat Exchanger (low pressure feedwater heater) Head	Pressure Boundary Structural Integrity
Heat Exchanger (condensate cooler) Shell	Structural Integrity
Heat Exchanger (final sample cooler, hotwell/polishing demineralizer discharge) Shell	Structural Integrity
Heat Exchanger (low pressure feedwater heater) Shell	Pressure Boundary Structural Integrity
Main Condenser Shell	Pressure Boundary
Main Condenser Tubes	Heat Transfer Pressure Boundary
Main Condenser Tubesheet	Pressure Boundary
Main Condenser Water Box	Pressure Boundary
Orifice	Flow Restriction Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity

Table 2.3.4-1 Condensate System

Component/Commodity Group	Intended Functions
Pump Casing (auxiliary boiler feed)	Structural Integrity
Pump Casing (condensate booster pump auxiliary lube oil)	Structural Integrity
Pump Casing (condensate booster pump shaft driven main oil)	Structural Integrity
Pump Casing (condensate booster)	Structural Integrity
Pump Casing (condensate return tank)	Structural Integrity
Pump Casing (condensate storage tank)	Structural Integrity
Pump Casing (feedwater pump seal injection)	Structural Integrity
Pump Casing (hotwell sump)	Structural Integrity
Pump Casing (polishing demineralizer backwash)	Structural Integrity
Pump Casing (polishing demineralizer backwash sump)	Structural Integrity
Pump Casing (polishing demineralizer holding)	Structural Integrity
Pump Casing (polishing demineralizer precoat)	Structural Integrity
Pump Casing (sample holding tank)	Structural Integrity
Pump Discharge Head (hotwell)	Structural Integrity
Sight Glass	Structural Integrity Pressure Boundary

Table 2.3.4-1 Condensate System

Component/Commodity Group	Intended Functions
Strainer Body	Pressure Boundary Structural Integrity
Strainer Screen	Filtration
Tank (condensate storage)	Structural Integrity
Tank (feedwater pump turbine flash)	Structural Integrity
Tank (oil reservoir on condensate booster pump)	Structural Integrity
Tank (plant heating condensate return)	Structural Integrity
Tank (polishing demineralizer)	Structural Integrity
Tank (powdex and slurry)	Structural Integrity
Tank (sample holding)	Structural Integrity
Tank (upper surge)	Pressure Boundary
Tank (upper surge tank dome)	Pressure Boundary
Trap Body	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.4.2-1, Steam and Power Conversion - Condensate System - Aging Management Evaluation.

2.3.4.2 Feedwater System

System Description

The feedwater system is broken into two subgroups, the main feedwater system and the emergency feedwater system.

Main Feedwater System

The main feedwater system is designed to supply feedwater to the two steam generators at a temperature, pressure, and flow rate compatible with reactor power output, main steam demand, and required steam generator level.

The main feedwater system receives water from the condensate system. The system starts at the discharge of the final low pressure feedwater heaters (the C feedwater heaters) and raises the condensate’s pressure via the feedwater pumps.

The steam turbine driven main feedwater pumps deliver feedwater through two stages of high pressure feedwater heaters (B and A), to a single feedwater distribution header where the feedwater flow is divided into two lines to the steam generators.

Emergency Feedwater System

The emergency feedwater system provides sufficient feedwater supply to the steam generators of each unit, during events that result in a loss of the condensate/main feedwater, to remove energy stored in the core and primary coolant. Three emergency feedwater pumps are provided for each unit, two motor driven pumps and a turbine driven pump. Each motor driven pump normally serves a separate steam generator; while the turbine driven pump normally serves both steam generators. Emergency feedwater is supplied to each steam generator through its auxiliary feedwater header.

System Intended Functions

Portions of the feedwater system are relied upon to maintain containment integrity. The feedwater system provides isolation of feedwater flow following a main steam line break, tube leak, or reactor shutdown. The emergency feedwater system provides an assured source of feedwater to the steam generators to remove decay heat until the low pressure injection system may be operated or the main feedwater system is restored, provides isolation of emergency feedwater flow following certain events to prevent dilution of the reactor building sump, provides shell cooling of an isolated steam generator during plant cooldown when the main feedwater system is unavailable and prevents emergency feedwater pump runout and steam generator tube flow induced vibration. Therefore, the feedwater system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the feedwater system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the feedwater system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the feedwater system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the feedwater system are relied upon for compliance with regulations for SBO (10 CFR 50.63), fire protection (10 CFR 50.48), EQ (10 CFR 50.49), and ATWS (10 CFR 50.62).

Therefore, the feedwater system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the feedwater system can be found in the UFSAR Sections 10.1, 10.4.6, 10.4.7, and Figures 10-7 and 10-8.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the feedwater system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-121B-1.1
- OSLRD-121B-1.2
- OSLRD-121B-1.3
- OSLRD-121B-1.4
- OSLRD-121B-1.5
- OSLRD-121B-2.1
- OSLRD-121B-2.2
- OSLRD-121B-2.3
- OSLRD-121B-2.4
- OSLRD-121B-2.5
- OSLRD-121B-3.1
- OSLRD-121B-3.2
- OSLRD-121B-3.3
- OSLRD-121B-3.4
- OSLRD-121B-3.5
- OSLRD-121D-1.1

- OSLRD-121D-2.1
- OSLRD-121D-3.1

Secondary Drawings

- OSLRD-110A-1.1
- OSLRD-110A-1.11
- OSLRD-110A-1.12
- OSLRD-110A-1.13
- OSLRD-110A-2.1
- OSLRD-110A-2.11
- OSLRD-110A-2.12
- OSLRD-110A-3.1
- OSLRD-110A-3.11
- OSLRD-110A-3.12
- OSLRD-121A-1.7
- OSLRD-121A-2.7
- OSLRD-121A-3.7
- OSLRD-122A-1.3
- OSLRD-122A-1.4
- OSLRD-122A-2.3
- OSLRD-122A-2.4
- OSLRD-122A-3.3
- OSLRD-122A-3.4
- OSLRD-122B-1.1
- OSLRD-122B-1.6
- OSLRD-122B-2.1
- OSLRD-122B-2.6
- OSLRD-122B-3.1
- OSLRD-122B-3.6
- OSLRD-123A-1.1
- OSLRD-123A-1.3
- OSLRD-123A-1.5
- OSLRD-123A-2.1
- OSLRD-123A-2.3
- OSLRD-123A-2.5
- OSLRD-123A-3.1
- OSLRD-123A-3.3
- OSLRD-123A-3.5
- OSLRD-124A-1.3
- OSLRD-124A-2.3
- OSLRD-124A-3.3
- OSLRD-125A-1.2
- OSLRD-125A-1.4
- OSLRD-125A-2.1
- OSLRD-125A-2.3
- OSLRD-125A-3.2
- OSLRD-125A-3.4

- OSLRD-128A-1.2
- OSLRD-131A-1.2
- OSLRD-131A-2.2
- OSLRD-131A-3.2
- OSLRD-135B-1.2
- OSLRD-135B-2.2
- OSLRD-135B-3.2
- OSLRD-137B-1.4
- OSLRD-137B-2.4
- OSLRD-137B-3.4

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-2, Feedwater System.

Table 2.3.4-2 Feedwater System

Component/Commodity Group	Intended Functions
Accumulator	Structural Integrity
Bolting	Pressure Boundary Structural Integrity
Flexible Connection	Structural Integrity
Flow Element	Flow Restriction Pressure Boundary Structural Integrity
Heat Exchanger (high pressure feedwater heater) Head	Structural Integrity
Heat Exchanger (high pressure feedwater heater) Shell	Structural Integrity
Heat Exchanger (sample cooler) Shell	Structural Integrity
Orifice	Flow Restriction Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity

Table 2.3.4-2 Feedwater System

Component/Commodity Group	Intended Functions
Piping and Piping Components	Pressure Boundary Structural Integrity
Pump Casing (feedwater)	Structural Integrity
Pump Casing (motor driven emergency feedwater)	Pressure Boundary
Pump Casing (OTSG recirc.)	Structural Integrity
Pump Casing (OTSG wet layup recirc.)	Structural Integrity
Pump Casing (titanium addition)	Structural Integrity
Pump Casing (turbine driven emergency feedwater)	Pressure Boundary
Sight Glass	Structural Integrity
Strainer Body	Structural Integrity
Tank (blowdown)	Structural Integrity
Tank (OTSG wet lay-up chemical addition)	Structural Integrity
Tank (titanium mixing)	Structural Integrity
Turbine Casing (emergency feedwater pump)	Pressure Boundary
Turbine Casing (feedwater pump)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.4.2-2, Steam and Power Conversion - Feedwater System - Aging Management Evaluation.

2.3.4.3 Heater Drain System

System Description

The heater drain system collects the condensed extraction steam from the feedwater heaters and forwards it to the main condenser in the condensate system.

System Intended Functions

Portions of the heater drain system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the heater drain system contain non-safety related piping components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the heater drain system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the heater drain system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the heater drain system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the heater drain system can be found in the UFSAR Section 10.4.1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the heater drain system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-123A-1.1
- OSLRD-123A-1.2
- OSLRD-123A-1.3
- OSLRD-123A-1.4
- OSLRD-123A-1.5
- OSLRD-123A-1.6
- OSLRD-123A-1.7
- OSLRD-123A-2.1
- OSLRD-123A-2.2
- OSLRD-123A-2.3
- OSLRD-123A-2.4
- OSLRD-123A-2.5
- OSLRD-123A-2.6
- OSLRD-123A-2.7
- OSLRD-123A-3.1
- OSLRD-123A-3.2
- OSLRD-123A-3.3
- OSLRD-123A-3.4
- OSLRD-123A-3.5
- OSLRD-123A-3.6
- OSLRD-123A-3.7

Secondary Drawings

- OSLRD-110A-1.11
- OSLRD-110A-1.12
- OSLRD-110A-1.13
- OSLRD-110A-2.11
- OSLRD-110A-2.12
- OSLRD-110A-3.11
- OSLRD-110A-3.12
- OSLRD-121A-1.10
- OSLRD-121A-2.10
- OSLRD-121A-3.10
- OSLRD-122C-1.1
- OSLRD-122C-1.2
- OSLRD-122C-1.3
- OSLRD-122C-1.4
- OSLRD-122C-2.1
- OSLRD-122C-2.2
- OSLRD-122C-2.3
- OSLRD-122C-2.4
- OSLRD-122C-3.1

- OSLRD-122C-3.2
- OSLRD-122C-3.3
- OSLRD-122C-3.4
- OSLRD-124A-1.2
- OSLRD-124A-2.2
- OSLRD-124A-3.2
- OSLRD-125A-1.2
- OSLRD-125A-2.1
- OSLRD-125A-3.2
- OSLRD-135B-1.3
- OSLRD-135B-2.3
- OSLRD-135B-3.3

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-3, Heater Drain System.

Table 2.3.4-3 Heater Drain System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Expansion Joint	Structural Integrity
Flow Element	Structural Integrity
Flexible Connection	Structural Integrity
Heat Exchanger (C heater drain cooler) Head	Structural Integrity
Heat Exchanger (C heater drain cooler) Shell	Structural Integrity
Heat Exchanger (E heater drain pump oil cooler) Head	Structural Integrity
Heat Exchanger (E heater drain pump seal water cooler) Shell	Structural Integrity
Heat Exchanger (moisture separator drain tank demineralizer) Head	Structural Integrity

Table 2.3.4-3 Heater Drain System

Component/Commodity Group	Intended Functions
Heat Exchanger (moisture separator drain tank demineralizer) Shell	Structural Integrity
Heat Exchanger (moisture separator drain tank pump seal water cooler) Shell	Structural Integrity
Heat Exchanger (sample cooler) Shell	Structural Integrity
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Pump Casing (E heater drain)	Structural Integrity
Pump Casing (E heater drain auxiliary oil)	Structural Integrity
Pump Casing (E heater drain shaft driven main oil)	Structural Integrity
Pump Casing (heater drain sump)	Structural Integrity
Pump Casing (moisture separator reheater drain)	Structural Integrity
Pump Head (D heater drain)	Structural Integrity
Rupture Disc	Structural Integrity
Sight Glass	Structural Integrity
Strainer Body	Structural Integrity
Tank (C heater flash)	Structural Integrity

Table 2.3.4-3 Heater Drain System

Component/Commodity Group	Intended Functions
Tank (D heater flash)	Structural Integrity
Tank (first stage reheater drain)	Structural Integrity
Tank (moisture separator drain demineralizer)	Structural Integrity
Tank (moisture separator reheater drain)	Structural Integrity
Tank (oil reservoir on E heater drain pump)	Structural Integrity
Tank (second stage reheater drain)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.4.2-3, Steam and Power Conversion - Heater Drain System - Aging Management Evaluation.

2.3.4.4 High Pressure Turbine Exhaust System

System Description

The high pressure turbine exhaust system routes high pressure turbine extraction steam to feedwater heaters to heat condensate.

System Intended Functions

Portions of the high pressure turbine exhaust system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the high pressure turbine exhaust system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related piping components connected to and providing support for the safety related functional boundary of the system. Therefore, the high pressure turbine exhaust system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the high pressure turbine exhaust system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the high pressure turbine exhaust system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the high pressure turbine exhaust system can be found in the UFSAR Section 10.2.2.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the high pressure turbine exhaust system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-122B-1.2
- OSLRD-122B-1.6
- OSLRD-122B-1.7
- OSLRD-122B-2.2
- OSLRD-122B-2.6
- OSLRD-122B-2.7
- OSLRD-122B-3.2
- OSLRD-122B-3.6
- OSLRD-122B-3.7

Secondary Drawings

- OSLRD-122C-1.1
- OSLRD-122C-2.1
- OSLRD-122C-3.1
- OSLRD-148B-1.1

- OSLRD-148B-2.1
- OSLRD-148B-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-4, High Pressure Turbine Exhaust System.

Table 2.3.4-4 High Pressure Turbine Exhaust System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Flow Element	Structural Integrity
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.4.2-4, Steam and Power Conversion - High Pressure Turbine Exhaust System - Aging Management Evaluation.

2.3.4.5 Heater Vent System

System Description

The heater vent system provides for the removal of non-condensable gases from the feedwater heater shells to the main condenser.

System Intended Functions

Portions of the heater vent system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the heater vent system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related piping components connected to and providing support for the safety related functional boundary of the system. Therefore, the heater vent system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the heater vent system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the heater vent system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the heater vent system can be found in the UFSAR Section 10.4.1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the heater vent system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-123A-1.2
- OSLRD-123A-1.5
- OSLRD-123A-1.6
- OSLRD-123A-1.7
- OSLRD-123A-2.2
- OSLRD-123A-2.5
- OSLRD-123A-2.6
- OSLRD-123A-2.7
- OSLRD-123A-3.2
- OSLRD-123A-3.5

- OSLRD-123A-3.6
- OSLRD-123A-3.7

Secondary Drawings

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-5, Heater Vent System.

Table 2.3.4-5 Heater Vent System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Expansion Joint	Structural Integrity
Flexible Connection	Structural Integrity
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Strainer Body	Structural Integrity
Tank (moisture collection)	Structural Integrity
Trap Body	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.4.2-5, Steam and Power Conversion - Heater Vent System - Aging Management Evaluation.

2.3.4.6 Low Pressure Turbine Extraction System

System Description

The low pressure turbine extraction system routes low pressure turbine extraction steam to feedwater heaters to heat condensate.

System Intended Functions

Portions of the low pressure turbine extraction system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the low pressure turbine extraction system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the low pressure turbine extraction system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the low pressure turbine extraction system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the low pressure turbine extraction system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the low pressure turbine extraction system can be found in the UFSAR Section 10.2.2 and Figure 10-2.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the low pressure turbine extraction system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-122B-1.3
- OSLRD-122B-1.4
- OSLRD-122B-1.5
- OSLRD-122B-1.7
- OSLRD-122B-2.3
- OSLRD-122B-2.4
- OSLRD-122B-2.5
- OSLRD-122B-2.7
- OSLRD-122B-3.3
- OSLRD-122B-3.4
- OSLRD-122B-3.5
- OSLRD-122B-3.7

Secondary Drawings

- OSLRD-122A-1.3
- OSLRD-122A-2.3
- OSLRD-122A-3.3

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-6, Low Pressure Turbine Extraction System.

Table 2.3.4-6 Low Pressure Turbine Extraction System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Expansion Joint	Pressure Boundary
Flow Element	Flow Restriction Pressure Boundary Structural Integrity
Piping	Pressure Boundary Structural Integrity

Table 2.3.4-6 Low Pressure Turbine Extraction System

Component/Commodity Group	Intended Functions
Piping and Piping Components	Pressure Boundary Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.4.2-6, Steam and Power Conversion - Low Pressure Turbine Extraction System - Aging Management Evaluation.

2.3.4.7 Auxiliary Steam System

System Description

The auxiliary steam system supplies startup steam as necessary when the main steam system is not available. Startup steam can be cross connected between the three ONS units to allow an operating unit's main steam system to supply startup steam to another unit. Additionally, a shared auxiliary boiler is provided in the event other sources of steam are not available.

The auxiliary steam system provides steam to the turbine driven emergency feedwater pump (as a backup source), the condensate steam air ejectors, the main feedwater pump turbines, the steam seal header, and low pressure feedwater heaters.

System Intended Functions

Portions of the auxiliary steam system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the auxiliary steam system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the auxiliary steam system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the auxiliary steam system are relied upon for compliance with regulations for SBO (10 CFR 50.63) and fire protection (10 CFR 50.48). Therefore, the auxiliary steam system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the auxiliary steam system can be found in the UFSAR Section 10.3.2 and Figure 10-1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the auxiliary steam system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-128A-1.1
- OSLRD-128A-1.2
- OSLRD-128A-2.1
- OSLRD-128A-3.1

Secondary Drawings

- OSLRD-122A-1.4
- OSLRD-122A-2.4
- OSLRD-122A-3.4
- OSLRD-127B-1.1
- OSLRD-135A-1.1
- OSLRD-137C-1.1
- OSLRD-148B-1.1
- OSLRD-148B-2.1
- OSLRD-148B-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-7, Auxiliary Steam System.

Table 2.3.4-7 Auxiliary Steam System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Desuperheater	Structural Integrity
Expansion Joint	Structural Integrity
Flexible Connection	Structural Integrity
Flow Element	Structural Integrity
Orifice	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Sight Glass	Structural Integrity
Strainer Body	Structural Integrity
Tank (auxiliary steam boiler drum)	Structural Integrity
Trap Body	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.4.2-7, Steam and Power Conversion - Auxiliary Steam System - Aging Management Evaluation.

2.3.4.8 Main Steam System

System Description

The main steam system transports dry, superheated steam from the steam generators to the main turbine and main feedwater pump turbines. In addition, the main steam system supplies steam to drive the emergency feedwater pump turbine during emergency operation and a variety of other components during normal operation. The main steam system is relied upon to dissipate heat from the reactor coolant system following a load rejection, turbine or reactor trip by dumping steam to the condenser and/or atmosphere. The main steam system is also used to achieve normal cooldown to low pressure injection system initiation conditions.

System Intended Functions

Portions of the main steam system are relied upon to maintain containment integrity. Portions of the main steam system provide overpressure protection for the steam generators and the main steam piping. It provides main steam line isolation as well as decay heat removal via the main steam relief valves and the atmospheric dump valves. Therefore, the main steam system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the main steam system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the main steam system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the main steam system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the main steam system are relied upon for compliance with regulations for SBO (10 CFR 50.63), fire protection (10 CFR 50.48), and EQ (10 CFR 50.49). Therefore, the main steam system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the main steam system can be found in the UFSAR Section 10.3 and Figure 10-1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the main steam system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-122A-1.1
- OSLRD-122A-1.2
- OSLRD-122A-1.3
- OSLRD-122A-1.4
- OSLRD-122A-1.6
- OSLRD-122A-2.1
- OSLRD-122A-2.2
- OSLRD-122A-2.3
- OSLRD-122A-2.4
- OSLRD-122A-2.6
- OSLRD-122A-3.1
- OSLRD-122A-3.2
- OSLRD-122A-3.3
- OSLRD-122A-3.4
- OSLRD-122A-3.6

Secondary Drawings

- OSLRD-121C-1.1
- OSLRD-121C-1.2
- OSLRD-121C-2.1
- OSLRD-121C-2.2
- OSLRD-121C-3.2
- OSLRD-122B-1.1
- OSLRD-122B-1.2
- OSLRD-122B-1.3
- OSLRD-122B-1.4
- OSLRD-122B-1.5
- OSLRD-122B-2.1
- OSLRD-122B-2.2
- OSLRD-122B-2.3
- OSLRD-122B-2.4
- OSLRD-122B-2.5

- OSLRD-122B-3.1
- OSLRD-122B-3.2
- OSLRD-122B-3.3
- OSLRD-122B-3.4
- OSLRD-122B-3.5
- OSLRD-122C-1.1
- OSLRD-122C-1.2
- OSLRD-122C-1.3
- OSLRD-122C-2.1
- OSLRD-122C-2.2
- OSLRD-122C-2.3
- OSLRD-122C-3.1
- OSLRD-122C-3.2
- OSLRD-122C-3.3
- OSLRD-128A-1.1
- OSLRD-128A-2.1
- OSLRD-128A-3.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-8, Main Steam System.

Table 2.3.4-8 Main Steam System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Expansion Joint	Structural Integrity
Flow Element	Structural Integrity
Heat Exchanger (moisture separator reheater) Head	Structural Integrity
Heat Exchanger (moisture separator reheater) Shell	Structural Integrity
Orifice	Pressure Boundary Flow Restriction
Piping	Pressure Boundary Structural Integrity

Table 2.3.4-8 Main Steam System

Component/Commodity Group	Intended Functions
Piping and Piping Components	Pressure Boundary Structural Integrity
Separator	Structural Integrity
Strainer Body	Pressure Boundary Structural Integrity
Strainer Screen	Filtration
Tank (main steam bypass drain pumping trap tank)	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.4.2-8, Steam and Power Conversion - Main Steam System - Aging Management Evaluation.

2.3.4.9 Turbine and Auxiliaries System

System Description

The turbine and auxiliaries system converts the thermal energy of steam produced in the steam generators into mechanical shaft power for the generator. Each unit’s turbine-generator consists of a tandem (single shaft) arrangement of a double-flow high pressure turbine and three identical double-flow low pressure turbines driving a direct-coupled generator.

System Intended Functions

Portions of the turbine and auxiliaries system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the turbine and auxiliaries system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the turbine and auxiliaries system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the turbine and auxiliaries system are relied upon for compliance with regulations for ATWS (10 CFR 50.62) and fire protection (10 CFR 50.48). Therefore, the turbine and auxiliaries system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the turbine and auxiliaries system can be found in the UFSAR Section 10.2 and Figures 10-2 and 10-3.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the turbine and auxiliaries system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- None

Secondary Drawings

- OSLRD-122B-1.2
- OSLRD-122B-1.3
- OSLRD-122B-1.4
- OSLRD-122B-1.5
- OSLRD-122B-1.8
- OSLRD-122B-2.2
- OSLRD-122B-2.3
- OSLRD-122B-2.4
- OSLRD-122B-2.5

- OSLRD-122B-2.8
- OSLRD-122B-3.2
- OSLRD-122B-3.3
- OSLRD-122B-3.4
- OSLRD-122B-3.5
- OSLRD-122B-3.8

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-9, Turbine and Auxiliaries System.

Table 2.3.4-9 Turbine and Auxiliaries System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Turbine Casing (high pressure)	Structural Integrity
Turbine Casing (low pressure)	Pressure Boundary

The AMR results for these component types are indicated in Table 3.4.2-9, Steam and Power Conversion System – Turbine and Auxiliaries System - Aging Management Evaluation.

2.3.4.10 Plant Heating System

System Description

The plant heating system distributes space heating throughout the plant via heat exchangers. The plant heating system steam is supplied from the auxiliary steam system or high pressure turbine exhaust system.

System Intended Functions

Portions of the plant heating system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the plant heating system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the plant heating system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the plant heating system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the plant heating system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

No additional details of the plant heating system can be found in the UFSAR.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the plant heating system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-148B-1.1
- OSLRD-148B-1.2
- OSLRD-148B-2.1
- OSLRD-148B-2.2
- OSLRD-148B-3.1
- OSLRD-148B-3.2

Secondary Drawings

- OSLRD-122A-1.5
- OSLRD-122A-1.6
- OSLRD-122A-2.5
- OSLRD-122A-2.6
- OSLRD-122A-3.5
- OSLRD-122A-3.6

- OSLRD-122B-2.6
- OSLRD-122B-2.9
- OSLRD-122B-3.9
- OSLRD-126C-1.4
- OSLRD-127B-2.1

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-10, Plant Heating System.

Table 2.3.4-10 Plant Heating System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Heat Exchanger (air handler) Tubes	Structural Integrity
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Strainer Body	Structural Integrity
Trap Body	Pressure Boundary Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.4.2-10, Steam and Power Conversion – Plant Heating System - Aging Management Evaluation.

2.3.4.11 Steam Drain System

System Description

The steam drain system provides steam traps, pumping traps, and condensate drains at various low points in the main steam system piping to remove accumulated condensate.

System Intended Functions

Portions of the steam drain system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the steam drain system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the steam drain system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the steam drain system are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the steam drain system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the steam drain system can be found in UFSAR Section 10.4.1.1.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system's primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the steam drain system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-122B-2.9
- OSLRD-122B-3.9

Secondary Drawings

- OSLRD-121A-3.7
- OSLRD-121C-1.2
- OSLRD-121C-2.2
- OSLRD-121C-3.2
- OSLRD-122A-1.1
- OSLRD-122A-1.2
- OSLRD-122A-1.3
- OSLRD-122A-1.4
- OSLRD-122A-1.5
- OSLRD-122A-1.6
- OSLRD-122A-2.1
- OSLRD-122A-2.2
- OSLRD-122A-2.3
- OSLRD-122A-2.4
- OSLRD-122A-2.5
- OSLRD-122A-2.6
- OSLRD -122A-3.1
- OSLRD-122A-3.2
- OSLRD-122A-3.3
- OSLRD-122A-3.4
- OSLRD-122A-3.5
- OSLRD-122A-3.6
- OSLRD-122B-1.1
- OSLRD-122B-1.2
- OSLRD-122B-1.3
- OSLRD-122B-1.4
- OSLRD-122B-1.5
- OSLRD-122B-1.6
- OSLRD-122B-1.7
- OSLRD-122B-2.1
- OSLRD-122B-2.2
- OSLRD-122B-2.3
- OSLRD-122B-2.4
- OSLRD-122B-2.5
- OSLRD-122B-2.6
- OSLRD-122B-2.7
- OSLRD-122B-3.1
- OSLRD-122B-3.2
- OSLRD-122B-3.3
- OSLRD-122B-3.4
- OSLRD-122B-3.5
- OSLRD-122B-3.6
- OSLRD-122B-3.7
- OSLRD-122C-1.1
- OSLRD-122C-1.2
- OSLRD-122C-2.1

- OSLRD-122C-2.2
- OSLRD-122C-3.1
- OSLRD-122C-3.2

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-11, Steam Drain System.

Table 2.3.4-11 Steam Drain System

Component/Commodity Group	Intended Functions
Bolting	Pressure Boundary Structural Integrity
Orifice	Flow Restriction Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Sight Glass	Structural Integrity
Strainer Body	Structural Integrity Pressure Boundary
Tank (main steam lead drain tank)	Structural Integrity
Trap Body	Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.4.2-11, Steam and Power Conversion System – Steam Drain System - Aging Management Evaluation.

2.3.4.12 Steam Seal System

System Description

The steam seal system delivers steam to the main turbine shafts and feedwater pump turbine shafts for sealing purposes. The seal steam is condensed in the steam packing exhaust steam seal condenser and drains to the condensate storage tank.

System Intended Functions

Portions of the steam seal system contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the steam seal system contain non-safety related components that have the potential to cause an adverse spatial interaction with safety related equipment and/or non-safety related components connected to and providing support for the safety related functional boundary of the system. Therefore, the steam seal system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the steam seal system are relied upon for compliance with regulations for SBO (10 CFR 50.63) and fire protection (10 CFR 50.48). Therefore, the steam seal system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the steam seal system can be found in the UFSAR Section 10.1 and Figures 10-2 and 10-3.

System Evaluation Boundary

The system evaluation boundaries are identified by highlighted system flow diagrams that identify the flow paths associated with each of the system intended functions. The flow paths for (a)(1) functions, (a)(2) functions required to functionally support a 10 CFR 54.4(a)(1) function, and (a)(3) functions are highlighted blue. The flow paths for (a)(2) functions related to adverse physical interactions are highlighted magenta. The highlighted drawings constitute the SLR boundary drawings.

Oconee flow diagrams have multiple systems on one drawing. A system’s primary drawing has the name of the system in the title and the drawing consists of mostly the system flow paths. This would be an example of a primary drawing.

Since systems share drawings, system flow paths can be depicted on flow diagrams not labeled with the system in the title. This would be an example of a secondary drawing.

The SLR evaluation boundaries of the steam seal system include the components located within the flow diagram system boundary flags, or as modified by SLR system boundary flags.

Subsequent License Renewal Boundary Drawings

Primary Drawings

- OSLRD-122B-1.1
- OSLRD-122B-1.8
- OSLRD-122B-2.1
- OSLRD-122B-2.8
- OSLRD-122B-3.1
- OSLRD-122B-3.8

Secondary Drawings

- OSLRD-121A-1.6
- OSLRD-121A-2.6
- OSLRD-121A-3.6

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.3.4-12, Steam Seal System.

Table 2.3.4-12 Steam Seal System

Component/Commodity Group	Intended Functions
Bolting	Pressure boundary Structural Integrity
Damper Housing (steam packing exhauster fan)	Structural Integrity
Desuperheater	Structural Integrity
Fan Housing (steam packing exhauster)	Structural Integrity
Flexible Connection	Structural Integrity
Heat Exchanger (steam seal condenser) Head	Structural Integrity
Heat Exchanger (steam seal condenser) Shell	Structural Integrity

Table 2.3.4-12 Steam Seal System

Component/Commodity Group	Intended Functions
Orifice	Flow Restriction Pressure Boundary
Piping	Pressure Boundary Structural Integrity
Piping and Piping Components	Pressure Boundary Structural Integrity
Valve Body	Pressure Boundary Structural Integrity

The AMR results for these component types are indicated in Table 3.4.2-12, Steam and Power Conversion System – Steam Seal System - Aging Management Evaluation.

2.4 SCOPING AND SCREENING RESULTS: CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

2.4.1 AUXILIARY BUILDING

<u>System Description</u>

ONS has two auxiliary buildings. One structure is shared by the Unit 1 and 2 reactors; the other structure supports the Unit 3 reactor. The auxiliary buildings are essentially free-standing, reinforced concrete structures with no structural tie-ins to either the turbine buildings or the reactor buildings. The buildings are constructed on reinforced concrete mat foundations. Below grade, the buildings consist of reinforced concrete walls and slabs. Above grade, the buildings consist primarily of reinforced concrete columns, beams, and slabs. All below-grade construction joints in exterior walls are protected by cast-in-place water stops. Separation of the auxiliary building from the reactor building was established during construction by means of a cork expansion joint.

The auxiliary buildings serve as enclosures to protect the auxiliary systems supporting the reactor coolant system, the control room, and other systems necessary for the safe operation of the plant.

The auxiliary buildings also include the hot machine shop. The hot machine shop and its extension are located between the Unit 1 and 2 reactor buildings and are adjacent to the west side of the Units 1 and 2 spent fuel pool. The hot machine shop structure is constructed of reinforced concrete floor and roof slabs supported on concrete beams. The hot machine shop shares reinforced concrete walls on the east and north sides with the spent fuel pool and fuel loading area, respectively. The south and west sides consist of reinforced concrete columns with infilled concrete block walls. The hot machine shop extension is a steel frame structure with a metal deck built up roof and exterior block walls.

A reinforced concrete tunnel extends from the auxiliary building to the hot machine shop by passing under the units 1 and 2 spent fuel pool. This tunnel provides a sheltered and shielded passage for equipment between the auxiliary building areas to the machine shop work area.

The auxiliary buildings are comprised of structural components whose materials of construction are either reinforced concrete or steel. Fire barriers and lead shielding are structural components that are also within the evaluation boundary of the ONS auxiliary buildings. Fiber reinforced polymer exists on the exterior of the outside masonry block wall.

ONS has two spent fuel pools. Units 1 and 2 share a spent fuel pool, while Unit 3 has its own spent fuel pool. They are located within the auxiliary building. The east side spent fuel pool wall near column line "T" is a shared auxiliary building wall and is a support wall with the rest of the auxiliary building. The west side wall extends downward to a grade beam. The end walls are partially supported across the roof slabs of the auxiliary building first floor valve rooms. The end walls extend to the west side grade beam. For the combined Unit 1 and 2 spent fuel pool there are 3 interior column supports under the pool. The 2 end columns extend up from the valve room walls. For Unit 3 the north end wall is supported by a block concrete pour. The spent fuel pools also contain a steel liner, structural steel and the spent fuel storage racks. These components are all made from stainless steel.

The auxiliary building also includes the following cranes: decay heat cooler hoists, letdown filter hoists, low pressure injection hoist, high pressure injection hoist, reactor building spray hoist, spent fuel pool new fuel elevator hoist, spent fuel pool new fuel bridge with fuel hoist, spent fuel pool crane, spent fuel pool bridge hoists electric chain, spent fuel pool pie jib crane pendanty hoist, fuel storage building tran units, demineralizer area hoist, spent fuel pool handling auxiliary hoist chain, and control battery hoist cranes.

System Intended Functions

Portions of the auxiliary building perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the auxiliary building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the auxiliary building contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the auxiliary building provide structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of a function described in 10 CFR 54.4(a)(1). Therefore, the auxiliary building is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the auxiliary building are relied upon for compliance with regulations for fire protection (10 CFR 50.48), SBO (10 CFR 50.63), and ATWS (10 CFR 50.62). Therefore, the auxiliary building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details of the auxiliary building can be found in UFSAR Sections 3.2, 3.4, 3.7, and 3.8.4.

System Evaluation Boundaries

The evaluation boundary for the auxiliary building includes the foundation, internal structural members, external walls and roof. Also included are the spent fuel pool, spent fuel storage racks, battery racks, auxiliary building cranes, doors, metal siding, masonry block walls, and fiber reinforced polymer. The low pressure injection room sumps and cover plates, in addition to waste tanks stainless steel lined cover slabs, are within the evaluation boundary of the auxiliary building.

The piping penetrations, electrical penetrations, heating and ventilation penetrations, seismic gap material (cork) and fire barriers (fire seals, fire stops, fire wraps, coatings) are addressed as bulk commodities in Section 2.4.8. Cable trays and conduit, electrical panels, equipment component supports (including the fuel transfer tube support), grout, louver frames, building drains, and pipe piles are also excluded from the evaluation boundaries as these structural components are addressed as bulk commodities in Section 2.4.8.

Subsequent License Renewal Boundary Drawings

The SLR boundary drawing for the auxiliary building is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.1-1, Auxiliary Building.

Table 2.4.1-1 Auxiliary Building

Structural Member	Intended Functions
Anchor	Structural Support
Battery Racks	Structural Support
Bolting (structural)	Structural Support
Concrete Elements Concrete Elements (accessible) Concrete Elements (inaccessible)	Fire Barrier Flood Barrier Heat Sink Missile Barrier Pressure Boundary Shelter, Protection Structural Support
Concrete Hatches	Fire Barrier Missile Barrier Shelter, Protection Structural Support
Cranes: Rails, Bridges, Structural Members, Structural Components	Structural Support
Cranes: Structural Bolting	Structural Support

Table 2.4.1-1 Auxiliary Building

Structural Member	Intended Functions
Doors	Fire Barrier Flood Barrier Pressure Boundary Structural Support
Fiber Reinforced Polymer	Structural Support
Lead Shield Support	Structural Support
Masonry Wall	Fire Barrier Shelter, Protection Structural Support
Metal Siding	Fire Barrier Pressure Boundary Shelter, Protection Structural Support
Roof Membrane	Shelter, Protection
Stainless Steel Elements	Shelter, Protection Structural Support
Steel Elements	Shelter, Protection Structural Support
Spent Fuel Pool Liner Plates	Pressure Boundary Shelter, Protection Structural Support
Spent Fuel Storage Racks	Shelter, Protection Structural Support
Sump	Structural Support

The AMR results for these component types are indicated in Table 3.5.2-1, Containments, Structures, and Component Supports - Auxiliary Building - Aging Management Evaluation.

2.4.2 REACTOR BUILDING

System Description

The reactor building is a free standing structure that encloses the reactor coolant system to provide an essentially leak tight barrier against uncontrolled release of radioactivity to the environment. The reactor building is constructed of reinforced concrete and structural liner plate steel. The major elements of the reactor building are described below.

Dome and Cylinder Walls

The reinforced concrete dome and cylinder walls are prestressed by a post-tensioning system. The concrete, conventional reinforcing steel, and the post-tensioning system is utilized to account for the design loads.

The ring girder serves as the anchorage area for the upper end of the vertical tendons and for both ends of the dome tendons. Six vertical buttresses are provided along the exterior face of the cylinder to serve as the anchorage points for the hoop tendons. The hoop tendons extend for 120 degrees.

Floor

A reinforced concrete floor is provided inside containment above the embedded portion of the liner plate to protect the liner plate from punctures and corrosion that could breech the essentially leak tight barrier.

Foundation Slab

The conventionally reinforced concrete foundation slab serves as the structural foundation support for the containment. The vertical tendons extend through the foundation slab thickness and are anchored on the underside of the slab. A reinforced concrete enclosure, the lower tendon access gallery is provided at the underside of the foundation slab for access to the lower vertical tendon anchorages for tendon installation and surveillance purposes. The function of the tendon access gallery is to provide access to the bottom of the vertical tendons so that they can be tested and inspected. The lower tendon access gallery does not support the intended functions of the Containment and is not within the scope of the SLR.

The Liner Plate

The interior of the containment is lined with steel plates that are welded together. The liner plate covers the dome, the cylinder wall and also runs between the floor and the foundation slab to form an essentially leak tight barrier. The containment liner plate is attached to the concrete by means of an angle grid system stitch welded to the liner plate and embedded in the concrete. All penetrations were continuously welded to the liner plate before the concrete in which they are embedded was placed. The liner plate is coated inside containment for corrosion protection.

Personnel Hatch

Two hatches are provided into each containment for personnel access and egress. The larger personnel hatch is used as the primary access point into the containment. The smaller personnel hatch is used for emergency egress.

The personnel hatch consists of a double door, welded steel assembly. Each personnel hatch door is provided with flexible seals. The exterior door is provided with double seals to allow for local leakage testing between the seals.

Equipment Hatch

A single 19 foot diameter equipment hatch is provided for each of the containments. The equipment hatch is furnished with a double sealed flange and bolted, dished head.

Penetrations

All penetrations through the containment pressure boundary are designed to maintain the leak tight barrier to prevent uncontrolled release of radioactivity. In addition to supporting the leak tight barrier function, each penetration performs service related functions depending on the particular type of penetration. Penetrations may also serve as support points for systems such as piping passing through the containment boundary.

Penetrations include mechanical penetrations, electrical penetrations, and fuel transfer tube penetrations. These three types of penetrations are discussed in more detail in the following sections.

Mechanical Penetrations

Mechanical penetrations provide the means for passage of process piping transmitting liquids or gases across the containment boundary. The penetrations are solidly anchored to the containment wall or foundation slab precluding any requirements for expansion bellows.

Mechanical penetration details are provided in UFSAR Section 3.8.1.5.4.

Spare penetrations consist of a sleeve with welded end cap closure(s) or bolted blind flange plate(s) with gaskets at both ends of the penetration sleeve.

The containment sump penetrations provide passage of the low pressure injection system and reactor building spray piping across the containment boundary. The low pressure injection system serves to remove heat from the containment in the event of an accident. During normal operation, the inside end of the sump piping is open.

Electrical Penetrations

Electrical penetrations provide the means for electrical and instrumentation conductors to cross the containment boundary while maintaining the essentially leak tight barrier.

Electrical penetrations are provided in UFSAR Section 3.8.1.5.4.

Fuel Transfer Tube

The fuel transfer tubes penetrate the containment and link the refueling canal in the containment with the fuel transfer canal in the fuel handling building. They serve as the underwater pathway for moving the fuel assemblies into and out of the containment as part of the refueling operations occurring during plant shutdown.

During normal operation, a blind flange is in place on the fuel transfer tube penetration and serves as part of the containment essentially leak tight barrier.

Unit Vent

The unit vent stack is a vertical cylinder constructed of ASTM A36 plate. The stack passes up through the auxiliary building roof and continues parallel to the reactor building buttress. Lateral support is provided by fabricated stiffened plate supports surrounding the vent stack and attached to the reactor building. Openings are provided which allow connections of reactor building purge, waste gas and auxiliary building ventilation. The function of the unit vent stack is to provide a path for release of filtered and unfiltered gaseous discharge at a height sufficient for proper diffusion.

Crane

Structural brackets provided for the reactor building polar crane runway are fabricated of A36 steel shapes and A516, Grade 70 insert plates. Structural brackets and thickened plates are welded into the ¼ inch liner plate similar to the penetration assemblies.The liner plate is thickened at large attachments such as the polar crane brackets to accommodate strength and welding requirements for the attachment and anchorage.

Reactor Building Internals

The reactor building internal structures consist of the reactor cavity, two steam generator compartments, and a refueling canal which is located between the steam generator compartments and above the reactor cavity for each reactor building.

The reactor cavity or primary shield houses the reactor vessel and serves as a biological shield wall.

The steam generator cavities, or secondary shield walls, house the steam generators, reactor coolant pumps, and associated NSSS piping. The pressurizer and quench tank are located in one cavity. Also located in the cavities are structural steel, platforms, ladders and grating for access to the various NSSS components. Six openings are provided in the lower shield walls to provide vent area. To ensure that no missile will impact on the reactor building containment liner plate, concrete shielding is provided for the liner plate area opposite the openings. The shielding extends beyond the openings so that any missile will impact on the shields. The secondary shield walls are designed so that sections can be removed to facilitate replacement of the steam generators. These removable sections are provided with post-tensioned tendon assemblies to provide structural adequacy.

The reactor coolant piping is self-supporting with respect to deadweight, seismic, and thermal loading. The reactor coolant pumps are partially supported by rod hangers with the remainder of the dead weight of the pump being supported by the piping. The pumps are supported laterally at the motor by means of hydraulic suppressors connected to the secondary shield wall. Structural steel is provided in the reactor building to allow access to the various elevations and areas inside containment for inspection and maintenance. The steel also provides support for several nuclear safety related components.

The floor surfaces of the structure consist of either reinforced concrete or galvanized steel grating. The floor beams are supported by columns or by attachments to the exterior surface of the secondary shield wall. Structural steel angle welded to the liner plate provides grating support.

System Intended Functions

Portions of the reactor building perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the reactor building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the reactor building contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the reactor building provide structural support, and shelter and protection for non-safety related SSCs whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Therefore, the reactor building is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the reactor building are relied upon for compliance with regulations for fire protection (10 CFR 50.48), SBO (10 CFR 50.63), and EQ (10 CFR 50.49). Therefore, the reactor building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the reactor building can be found in the UFSAR Sections 3.2, 3.4, 3.5, 3.6, 3.7, 3.8.1, 3.8.1.5.4, and 3.12, Figures 3-19, 3-20, 3-21, and Table 3-12.

System Evaluation Boundaries

The evaluation boundary for the reactor building includes the structural members of the containment, including the buttresses, dome, cylinder wall, floor, foundation slab, and ring girder. The reactor building also includes the liner, personnel and equipment hatches, mechanical and electrical penetrations, the unit vent stacks, lead shield support, cranes, anchorage (embedments and attachments), concrete elements (e.g. equipment pads, flood curbs, hatches, missile shields, reinforced concrete columns, slabs, wall, and sumps), doors, masonry walls, moisture barriers, steel elements (e.g. beams, plates, columns, stairs, ladders, grating, platforms, fuel transfer canal liner, and fuel transfer canal annulus seal plate), seals and gaskets, service level I coatings, tendon anchorage and tendon wires. Structural components not within the evaluation boundaries include: the fuel transfer tubes are evaluated with the spent fuel cooling system in Section 2.3.3; the emergency sump strainers are evaluated with the low pressure injection system in Section 2.3.2; and the cable tray and conduits and associated supports, equipment component supports (including sliding bearing plates), electrical and instrument panels and enclosures, instrument line support, instrument rack and frames, grout, and pipe supports are evaluated as bulk commodities in Section 2.4.8.

Subsequent License Renewal Boundary Drawings

The SLR boundary drawing for the reactor building is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.2-1, Reactor Building.

Table 2.4.2-1 Reactor Building

Structural Component	Intended Function
Anchorage/Embedment/Attachments	Pressure Boundary Structural Support
Bolting (structural)	Structural Support
Bolting (pressure retaining)	Pressure Boundary
Buttresses	Heat Sink Missile Barrier Shelter, Protection Structural Support

Table 2.4.2-1 Reactor Building

Structural Component	Intended Function
Concrete Elements	Flood Barrier Heat Sink Missile Barrier Pressure Boundary Shelter, Protection Structural Support
Concrete Elements (accessible)	Flood Barrier Heat Sink Missile Barrier Pressure Boundary Shelter, Protection Structural Support
Concrete Elements (inaccessible)	Flood Barrier Heat Sink Missile Barrier Pressure Boundary Shelter, Protection Structural Support
Cranes: Rails, Bridges, Structural Members, Structural Components	Structural Support
Cranes: Structural Bolting	Structural Support
Cylinder Walls	Fire Barrier Heat Sink Missile Barrier Shelter, Protection Structural Support
Dome	Heat Sink Missile Barrier Shelter, Protection Structural Support
Doors	Flood Barrier Pressure Boundary Structural Support

Table 2.4.2-1 Reactor Building

Structural Component	Intended Function
Floor	Heat Sink Missile Barrier Shelter, Protection Structural Support
Foundation Slab	Heat Sink Missile Barrier Shelter, Protection Structural Support
Lead Shield Support	Structural Support
Liner; Liner Anchors; Integral Attachments	Heat Sink Pressure Boundary Structural Support
Masonry Wall	Shelter, Protection Structural Support
Moisture Barrier	Shelter, Protection
Penetrations	Pressure Boundary Structural Support
Personnel Hatch, Emergency Personnel Hatch; Equipment Hatch	Pressure Boundary
Ring Girders	Heat Sink Missile Barrier Shelter, Protection Structural Support
Seals and Gaskets	Pressure Boundary Shelter, Protection
Service Level I Coatings	Maintain Coating Integrity
Steel Elements	Shelter, Protection Structural Support

Table 2.4.2-1 Reactor Building

Structural Component	Intended Function
Tendon Anchorage	Structural Support
Tendon Wire	Structural Support
Unit Vent	Gaseous Release Path

The AMR results for these component types are indicated in Table 3.5.2-2, Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation.

2.4.3 TURBINE BUILDING

System Description

The turbine buildings include the turbine building and the switchgear enclosures.

Turbine Buildings

The turbine building consists of a foundation and mat that is constructed of reinforced concrete. The turbine building substructure is founded on bedrock. Also, foundation dowels connect the mat foundation to the underlying bedrock. Above grade, the building consists of structural steel with metal siding.

The turbine building is bounded on the north side by the service building, on the west side by the auxiliary building. Both the south and east sides are primarily exposed to the environment. A sliding fire door exists on the north side that separates the service building from the turbine building.

The turbine building has three levels. The operating floor is constructed of a concrete pedestal for the turbine and generator. The other portions are concrete on steel framing. The mezzanine level consists of both concrete and metal grating on steel framed supports. The grade slab supports safety related equipment along with other equipment.

Switchgear Enclosures

The Unit 1 and 2 switchgear enclosure is a reinforced concrete structure. The walls contain penetrations for electrical bus, ventilation and personnel access. Ventilation for the structure and transformer CT 4 is provided by fans on the east and penetrations through the north and south walls. Ventilation penetrations are angled to provide missile protection. Interior walls provide missile protection at each personnel access door.

The switchgear enclosure is supported by battered pipe piles. The piles were filled with concrete during construction of the structure. The structure is divided into two separate rooms by a hollow concrete block firewall. Wide flange sections divide the firewall into three sections. The wide flanges and channels attached to plates embedded in the walls of the structure provide restraint for horizontal loads applied during a postulated seismic event. Seismic bracing of structural steel is provided for the transformer and the electrical bus.

A concrete door on the east end of the structure is mounted on a rail and can be slid parallel to the wall to provide access for maintenance of the CT 4 transformer. A plate embedded on the inside of the door helps provide missile protection for the doorway opening in the wall. A curb at the base of the door opening prevents oil or fire from penetrating the building during a postulated fire in the CT 4 transformer.

The Unit 3 switchgear enclosure is a reinforced concrete structure. Interior walls provide missile protection at personnel access doors. Ventilation for the structure is provided by fans on the west wall of the structure and by the door openings through the walls. The switchgear enclosure is supported by battered pipe piles filled with concrete. Angle bracing provides seismic restraint to the electrical bus.

System Intended Functions

Portions of the turbine building provide structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the turbine building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the turbine building contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the turbine building provide structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of a function described in 10 CFR 54.4(a)(1). Therefore, the turbine building is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the turbine building structure are relied upon for compliance with regulations for fire protection (10 CFR 50.48), SBO (10 CFR 50.63), and ATWS (10 CFR 50.62). Therefore, the reactor building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the turbine building structure can be found in UFSAR Sections 3.2, 3.4, 3.7, and 3.8.5.

System Evaluation Boundaries

The evaluation boundary for the turbine building includes the foundation, internal structural members, external walls and roof. Also included are the turbine building cranes, doors, metal siding, and masonry block walls.

The piping penetrations, electrical penetrations, and heating and ventilation penetrations, fire barriers (fire seals, fire stops, fire wraps, coatings), cable trays and conduit, electrical panels, equipment component supports, grout, louver frames, building drains, and pipe piles are excluded from the evaluation boundaries as these structural components are addressed as bulk commodities in Section 2.4.8.

Subsequent License Renewal Boundary Drawings

The SLR boundary drawing for the turbine building is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.3-1, Turbine Building.

Table 2.4.3-1 Turbine Building

Structural Component	Intended Functions
Anchors	Structural Support
Bolting (structural)	Structural Support
Concrete Elements Concrete Elements (accessible) Concrete Elements (inaccessible)	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Support
Cranes: Rails, Bridges, Structural Members, Structural Components	Structural Support
Cranes: Structural Bolting	Structural Support
Doors	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Support
Masonry Wall	Fire Barrier Shelter, Protection Structural Support

Table 2.4.3-1 Turbine Building

Structural Component	Intended Functions
Metal Siding	Shelter, Protection
Roof Membrane	Shelter, Protection
Steel Elements	Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-3, Containments, Structures, and Component Supports - Turbine Building - Aging Management Evaluation.

2.4.4 KEOWEE HYDRO STATION

System Description

The Keowee hydro station includes the breaker vault, Keowee intake structure, Keowee powerhouse, Keowee service building, Keowee penstock and power tunnels, and the Keowee spillway.

Breaker Vault

The breaker vault provides tornado wind and tornado missile protection for the electrical equipment used to route power to meet the emergency power needs of ONS. The breaker vault is located in the electrical equipment bay of the Keowee powerhouse. The breaker vault is supported by the powerhouse operating floor. The structures walls and roof are constructed of thick concrete and provide missile protection for the electrical breakers. Two openings provide access for inspection and maintenance of the breakers. Each opening is protected from missile penetration by a rolling metal door consisting of plate welded to grating.

Keowee Intake Structure

The Keowee intake structure controls flow from Lake Keowee to the Keowee hydro station turbines via the penstock and power tunnels. The Keowee intake structure is a reinforced concrete structure with eight sides. Eight piers connected to a reinforced concrete compression ring girder at the base support a concrete silo type structure at the top. The concrete silo section supports a structural steel frame which in turn provides support for gate hoisting machinery. The intake also has a trash rack that provides structural support.

Keowee Powerhouse

The Keowee powerhouse provides support and protection for equipment and components used to generate emergency electrical power for ONS. The power produced by Keowee hydro station is used to meet the emergency power needs of ONS as well as the system generation needs of Duke Energy.

The Keowee powerhouse consists of a monolithic mass concrete substructure and structural steel superstructure. The concrete substructure is supported on rock. The concrete substructure supports two vertical turbines and contains a draft tube gallery, a scroll case access gallery, and a mechanical equipment gallery.

The structural steel superstructure is supported at the operating floor level. The steel frame is covered with insulated steel exterior panels and provides protection for the generators, a 270 ton bridge crane and associated electrical and mechanical equipment. Adjacent to the erection bay is the electrical switchgear bay which provides protection for electrical switchgear and bus.

Keowee Service Building

The Keowee service building is located adjacent to the Keowee powerhouse. The main floor consists of the computer room, office and break areas. The first subfloor houses the control room and the second subfloor houses the battery room. The foundation is a thick slab on grade. The subfloor walls are thick reinforced concrete with concrete slab floors. The main floor is a steel structure with concrete block walls.

Keowee Penstock and Power Tunnels

The Keowee penstock and power tunnels convey water from the intake structure in Lake Keowee to the Keowee hydro station turbines in the Keowee powerhouse. The power tunnel is approximately 600 feet long and extends from the cylindrical concrete intake structure to two penstocks that branch from the power tunnel to each unit. The power tunnel and approximately one-half of the penstocks downstream of the power tunnel are concrete lined. The downstream part of the penstocks is steel-lined with a concrete envelope around the steel lining. An “elbow” section that provides transition between the vertical intake cylinder and the horizontal power tunnel is also steel-lined and encased in concrete. The power and penstock tunnels are in excavated rock.

Keowee Spillway

The Keowee spillway permits the controlled discharge of storm inflow from rainfall events within the Lake Keowee drainage basin. The spillway prevents overtopping of the Keowee dam, the Little River dam and dikes, and the ONS intake canal dike during periods of high rainfall on the drainage basin.

The Keowee spillway consists of a mass concrete ogee (S-shape) structure with four taintor gates constructed of plate over a structural frame supported by an anchored structural steel grid. Below the ogee section is a long tapered concrete chute section on a 10 percent grade with mass concrete side walls and concrete flip bucket. The spillway is founded on rock. Mass concrete wingwalls form an approach channel to the spillway.

System Intended Functions

Portions of the Keowee hydro station provide structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the Keowee hydro station is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the Keowee hydro station contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the Keowee hydro station provide structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of a function described in 10 CFR 54.4(a)(1). Therefore, the Keowee hydro station is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the Keowee hydro station are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the Keowee hydro station is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the Keowee hydro station can be found in UFSAR Sections 3.2 and 3.8.5.3.2.

System Evaluation Boundaries

The evaluation boundary for the Keowee hydro station includes the foundation, internal and external structural members and roof of the Keowee powerhouse, Keowee breaker vault and Keowee service building. The evaluation boundary also includes the foundation, structural members and trash racks of the Keowee intake structure. The battery racks in the Keowee service building and cranes and hoists at the Keowee powerhouse and Keowee intake structure are within the evaluation boundary. The Keowee penstock and power tunnels along with the spillway and Keowee intake structure are water controlling structures that are considered within the evaluation boundary for the Keowee hydro station.

The Keowee hydro station also includes a transmission tower that is evaluated with electrical structures in Section 2.4.5. Cable trays and conduit, electrical panels, equipment component supports, grout, and building drains are excluded from the evaluation boundaries as these structural components are addressed as bulk commodities in Section 2.4.8.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the Keowee hydro station is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing.

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.4-1, Keowee Hydro Station.

Table 2.4.4-1 Keowee Hydro Station

Structural Component	Intended Functions
Anchor	Structural Support
Battery Racks	Structural Support
Bolting (Structural)	Structural Support
Concrete Elements Concrete Elements (accessible) Concrete Elements (Inaccessible)	Missile Barrier Shelter, Protection Structural Support
Concrete Hatches	Shelter, Protection Structural Support
Cranes: Rails, Bridges, Structural Members, Structural Components	Structural Support
Cranes: Structural Bolting	Structural Support
Doors	Missile Barrier Shelter, Protection Structural Support
Masonry Block	Shelter, Protection Structural Support
Penstock, Power Tunnels, Spillway, Intake: Bolting (Structural)	Structural Support
Penstock, Power Tunnels, Spillway, Intake: Concrete Elements	Direct Flow Structural Support
Penstock, Power Tunnels, Spillway, Intake: Stainless Steel Elements	Structural Support

Table 2.4.4-1 Keowee Hydro Station

Structural Component	Intended Functions
Penstock, Power Tunnels, Spillway, Intake: Steel Elements	Direct Flow Structural Support
Roof Membrane	Shelter, Protection
Steel Elements	Shelter, Protection Structural Support
Trash Rack Filter	Filter Structural Support

The AMR results for these component types are indicated in Table 3.5.2-4, Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation.

2.4.5 ELECTRICAL RELATED STRUCTURES

System Description

The electrical related structures within the scope of SLR consist of the 100 kV structure, 230 kV relay house, and 230 kV switchyard. Each is discussed in more detail below.

100 kV Structure

The 100 kV structure is an open structural steel structure consisting of vertical columns, beams with cross bracing and one cantilevered section. The steel structure is erected on a reinforced slab on grade.

230 kV Relay House

The 230 kV relay house is a rectangular structural steel superstructure consisting of a roof system supported by columns forming a rigid frame in the direction of its least dimension and is braced with diagonal bracing in the other direction. The steel structure is erected on a slab on grade.

230 kV Switchyard Structure

The 230 kV switchyard structure includes the following: bus support bases, coupling capacitor potential device support bases, disconnect switch supports, lightning arrestor supports, wave trap support structures, power circuit breaker bases, and strain structures and bases.

The 230 kV switchyard bus support structure, wave trap support structure, lightning arrestor support structure, coupling capacitor support structures, and disconnect switch support structures make up what is termed the 230 kV switchyard low structures. These structures are all constructed of cantilevers from a concrete foundation.

Bus support bases are cylindrical concrete structures embedded in the earth. These bases support electrical buswork support steel.

Coupling capacitor potential device support bases, disconnect switch supports, lightning arrestor supports, and wave trap supports are steel support posts supported by a reinforced concrete base.

Power circuit breaker bases are reinforced concrete footings embedded in the ground.

The structural steel strain structures and bases in the 230 kV switchyard and at Keowee are an integral part of the Keowee overhead power path. The foundations are rectangular, combined footings made of reinforced concrete.

System Intended Functions

The 230 kV switchyard and 230 kV relay house provide structural and/or functional support to safety related equipment. The 230 kV relay house provides shelter/protection to safety related equipment. Therefore, portions of the electrical related structures are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the electrical related structures contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. The 230 kV switchyard and 230 kV relay house provide structural support for non-safety related SSCs whose failure could prevent a safety related SSC from accomplishing a function described in 10 CFR 54.4(a)(1). Therefore, portions of the electrical related structures are within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

The 230 kV switchyard, 230 kV relay house, and the 100 kV structure are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the electrical related structures are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the electrical related structures can be found in UFSAR Sections 3.2, 3.8.5, and 8.2.

System Evaluation Boundaries

The evaluation boundaries for the electrical related structures include the steel elements, concrete element, and miscellaneous structural elements, except as noted below, that: support or shelter the portions of the 230 kV switchyard electrical distribution systems that are either part of the Keowee overhead emergency power or the SBO offsite power recovery paths. The evaluation boundary starts at the Keowee 230 kV transmission tower and includes the intervening transmission towers that support the overhead transmission lines to the 230 kV switchyard structure, the 230 kV relay house, the structural components that provide support to in scope electrical equipment within the 230 kV switchyard structure, and the shield wire pull off structures located on the turbine building roof that support the transmission lines from the 230 kV switchyard to the ONS powerhouse; and support in-scope electrical and mechanical equipment in the 100 kV structure, including oil circuit breaker OCB-101, disconnect switches, transformer CT5, and the pot head support structure, and the transformer deluge system.

Manhole and trenches located in the vicinity of the 230 kV switchyard structure and 100 kV structure are excluded from the evaluation boundaries; these structures are addressed as yard structures in Section 2.4.7. Cable trays and conduit, electrical panels, equipment component supports, grout, louver frames, and pipe piles are also excluded from the evaluation boundaries as these structural components are addressed as bulk commodities in Section 2.4.8.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the electrical related structures is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing.

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.5-1, Electrical Related Structures.

Table 2.4.5-1 Electrical Related Structures

Structural Component	Intended Function
Anchor	Structural Support
Battery Rack	Structural Support
Bolting (structural)	Structural Support
Concrete Elements (accessible)	Structural Support
Concrete Elements (inaccessible)	Structural Support
Doors	Shelter, Protection

Table 2.4.5-1 Electrical Related Structures

Structural Component	Intended Function
Masonry Wall	Structural Support
Metal Siding	Shelter, Protection
Roof Membrane	Shelter, Protection
Steel Elements	Shelter, Protection Structural Support
Transmission Tower	Structural Support

The AMR results for these component types are indicated in Table 3.5.2-5, Containments, Structures, and Component Supports - Electrical Related Structures - Aging Management Evaluation.

2.4.6 EARTHEN EMBANKMENTS

System Description

The earthen embankments include the intake canal dike, Keowee River dam, the Little River dam and dikes A, B, C and D.

Intake Canal Dike

The intake canal dike is a homogeneous embankment constructed of rolled earthfill and is designed to have an adequate factor of safety under the same conditions of seismic loadings as used for the design of ONS.

The dike has zoned filter drainage blankets under the downstream slope to collect and control seepage. The upstream face is riprapped with dumped riprap and quarry run stone. The riprap layer is a minimum of two feet thick and a twelve inch layer of graded gravel is provided under the riprap for the filter. The riprap is provided on the upstream slope to accommodate all reservoir water levels. Ground cover is provided to minimize erosion.

Keowee River Dam

The Keowee River dam is a homogenous embankment constructed of rolled earthfill and the design was reviewed by an independent board of consultants and approved by the Federal Power Commission (now the Federal Energy Regulatory Commission) in accordance with the license issued by that agency. The foundation exploration, foundation and abundant treatment, slope stability and seismic analysis of the Keowee River dam are described in the UFSAR Section 2.5.6.

Seepage monitoring weirs and pipes, observation wells and piezometers are installed in the embankment to monitor the performance of the dam. A three layered graded filter is provided under the downstream third of the dam to intercept safely any seepage through the embankment and foundation. Slope protection from wind-generated waves is provided on the upstream slope of the dam. Stone riprap is provided to accommodate all reservoir levels, including maximum drawdown and maximum flood. Ground cover is provided to minimize erosion.

Little River Dam and Dikes A, B, C, and D

The Little River dam and dikes A, B, C, and D are homogeneous embankments, constructed of rolled earthfill, that impound the Little River watershed of the Keowee Reservoir. The design of the dam and dikes was reviewed by an independent board of consultants and approved by the Federal Power Commission (FERC) in accordance with the license issued by that agency. The foundation exploration, foundation and abutment treatment, slope stability and seismic analysis are described in the UFSAR Section 2.5.6.

Seepage monitoring weirs and pipes, observation wells and piezometers are installed in the embankments to monitor performance. The dam and dikes A and D have zoned filter drainage blankets under the downstream slope to collect and control seepage. Slope protection from wind-generated waves is provided on the upstream slope for the Little River dam and dikes. Stone riprap is provided to accommodate all reservoir water levels including maximum drawdown and maximum flood. Ground cover is provided to minimize erosion.

System Intended Functions

Portions of the earthen embankments provide functional support to impound Lake Keowee which provides a source of water for generation of emergency electrical power required to mitigate the consequences of design basis events. Therefore, the earthen embankments are within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(1).

UFSAR References

Additional details for the earthen embankments can be found in UFSAR Sections 3.2 and 3.8.5.

System Evaluation Boundaries

The evaluation boundary for the earthen embankments includes the intake canal dike, Keowee River dam, Little River dam and dikes, and dikes A, B, C, and D.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the earthen embankments is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing.

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.6-1, Earthen Embankments.

Table 2.4.6-1 Earthen Embankments

Structural Component	Intended Functions
Earthen Water Control Structures	Structural Support

The AMR results for these component types are indicated in Table 3.5.2-6, Containments, Structures, and Component Supports - Earthen Embankments - Aging Management Evaluation.

2.4.7 YARD STRUCTURES

2.4.7.1 Borated Water Storage Tank Superstructure

System Description

The borated water storage tank superstructure is a steel barrier enclosure of the bottom of the borated water storage tank that provides protection for piping, valves, nozzles, and instrumentation against the effects of tornado missiles and wind loads. The borated water storage tank superstructure consists of a structural steel enclosure (i.e., beams, columns, and steel plate siding and roof) on top of a new concrete foundation surrounding the original borated water storage tank base slab.

System Intended Functions

Portions of the borated water storage tank superstructure perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the borated water storage tank superstructure is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the borated water storage tank superstructure contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. The borated water storage tank superstructure provides structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of a function described in 10 CFR 54.4(a)(1). Therefore, the borated water storage tank superstructure is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the borated water storage tank superstructure are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the borated water storage tank superstructure is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the borated water storage tank superstructure can be found in UFSAR Sections 3.2 and 3.2.1.1.1.

System Evaluation Boundaries

The evaluation boundary for the borated water storage tank superstructure includes the steel barrier tank enclosure, as well as the reinforced concrete foundations installed around existing borated water storage tank concrete base slabs. It includes the steel swing gate doors installed on the tank enclosure, but not the existing doors in the adjacent auxiliary building wall. The superstructure's outer sheet metal skin and underlying insulation serve no intended function and are not within the evaluation boundary. Likewise, the evaluation boundary does not include supports for lighting, receptacles, or other electrical appurtenances installed to support occupancy in the tank enclosure. It does not include the borated water storage tank foundation, which is addressed in bulk commodities in Section 2.4.8.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the borated water storage tank superstructure is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-1, Borated Water Storage Tank Superstructure.

Table 2.4.7-1 Borated Water Storage Tank Superstructure

Structural Component	Intended Function
Anchors	Structural Support
Bolting (structural)	Structural Support
Concrete Elements Concrete Elements (accessible) Concrete Elements (inaccessible)	Missile Barrier Structural Support

Table 2.4.7-1 Borated Water Storage Tank Superstructure

Structural Component	Intended Function
Doors (steel swing gates)	Missile Barrier Structural Support
Steel Elements	Missile Barrier Structural Support

The AMR results for these component types are indicated in Table 3.5.2-7, Containments, Structures, and Component Supports - Borated Water Storage Tank Superstructure - Aging Management Evaluation.

2.4.7.2 Essential Siphon Vacuum Building

System Description

The essential siphon vacuum building houses the essential siphon vacuum pumps, tanks, local control panel, control panel for essential siphon vacuum pump alternate power feed, siphon seal water filters, motor control center ESV, 150 kVA, 75 kVA and 6 kVA transformers, 120/240 and 208 VAC power panel boards and most of the essential siphon vacuum instrumentation. The building is a pre-engineered metal building of a single story, single span, rigid frame design, supported on a reinforced concrete foundation. The roof is a zinc coated steel standing seam panel system. The panels are attached to the roof purlins using concealed clips.

System Intended Functions

Portions of the essential siphon vacuum building perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the essential siphon vacuum building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the essential siphon vacuum building contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. The essential siphon vacuum building structure provides structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of a function described in 10 CFR 54.4(a)(1). Therefore, the essential siphon vacuum building is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the essential siphon vacuum building are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the essential siphon vacuum building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the essential siphon vacuum building can be found in UFSAR Sections 3.2, 3.8.5, and 9.2.2.2.5.

System Evaluation Boundaries

The evaluation boundary for the essential siphon vacuum building includes the concrete foundation, internal structural members, and external metal walls and roof. Equipment pads/ supports, piping supports, instrument supports, cable tray and conduit supports, and electrical enclosures are addressed as bulk commodities in Section 2.4.8.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the essential siphon vacuum building is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-2, Essential Siphon Vacuum Building.

Table 2.4.7-2 Essential Siphon Vacuum Building

Structural Component	Intended Function
Anchors	Structural Support
Bolting (structural)	Structural Support
Concrete Elements Concrete Elements (accessible) Concrete Elements (inaccessible)	Shelter, Protection Structural Support
Doors	Shelter, Protection Structural Support
Steel Elements	Shelter, Protection Structural Support
Metal Siding	Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-8, Containments, Structures, and Component Supports - Essential Siphon Vacuum Building - Aging Management Evaluation.

2.4.7.3 Intake Structure

System Description

The intake structure is a reinforced concrete structure located at the north end of the intake canal. The structure houses the pumps, supports the pump motors and the beginning sections of the condenser circulating water pipe. All steel surfaces not in contact with the concrete and subject to immersion are coated with metal primer. At the back of the structure is a utility trench rigidly attached to the intake structure and constructed of reinforced concrete.

System Intended Functions

Portions of the intake structure perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the intake structure is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the intake structure contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. The intake structure provides structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of a function described in 10 CFR 54.4(a)(1). Therefore, the intake structure is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the intake structure are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the intake structure is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the intake structure can be found in UFSAR Sections 3.2 and 3.2.1.1.2.

System Evaluation Boundaries

The evaluation boundary for the intake structure includes the reinforced concrete structure and associated structural steel and equipment supports. It also includes the reinforced concrete utility trench rigidly attached to the intake structure. Equipment pads/supports, piping supports, instrument supports, sheet piles, cable tray and conduit supports, and electrical enclosures are addressed as bulk commodities in Section 2.4.8.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the intake structure is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-3, Intake Structure.

Table 2.4.7-3 Intake Structure

Structural Component	Intended Function
Anchors	Structural Support
Bolting (structural)	Structural Support
Concrete Elements: Concrete Elements (accessible) Concrete Elements (inaccessible)	Shelter, Protection Structural Support
Steel Elements	Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-9, Containments, Structures, and Component Supports - Intake Structure - Aging Management Evaluation.

2.4.7.4 Protected Service Water Building

System Description

The protected service water building houses the major electrical equipment for the protected service water system. The protected service water building is constructed of reinforced concrete structure founded on structural fill. The building consists of a transformer room, a mezzanine, a cable spreading room, and two battery rooms.

System Intended Functions

Portions of the protected service water building perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the protected service water building structure is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the protected service water building contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. The protected service water building provides structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of a function described in 10 CFR 54.4(a)(1). Therefore, the protected service water building is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the protected service water building are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the protected service water building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the protected service water building can be found in UFSAR Sections 3.2, 9.7, and 9.7.3.5.

System Evaluation Boundaries

The evaluation boundary for the protected service water building structure includes the foundation, internal structural members, external walls and roof. The following items are addressed as bulk commodities in Section 2.4.8: equipment pads/supports, piping supports, instrument supports, cable tray and conduit supports, electrical enclosures, piping penetrations, electrical penetrations, heating and ventilation penetrations, and fire barriers (fire seals, fire stops, fire wraps, coatings).

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the protected service water building is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-4, Protected Service Water Building.

Table 2.4.7-4 Protected Service Water Building

Structural Component	Intended Function
Anchors	Structural Support
Battery Racks	Structural Support
Bolting (structural)	Structural Support

Table 2.4.7-4 Protected Service Water Building

Structural Component	Intended Function
Concrete Elements: Concrete Elements (accessible) Concrete Elements (inaccessible)	Flood Barrier Missile Barrier Shelter, Protection Structural Support
Cranes	Structural Support
Doors	Flood Barrier Missile Barrier Shelter, Protection Structural Support
Roof membrane	Shelter, Protection
Steel Elements	Flood Barrier Missile Barrier Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-10, Containments, Structures, and Component Supports - Protected Service Water Building - Aging Management Evaluation.

2.4.7.5 Protected Service Water Conduit Duct Banks

System Description

The protected service water conduit duct banks were constructed with the protected service water building and provide paths for electrical conductors as follows: conduit duct banks and manholes connecting the Keowee underground to the protected service water building; conduit duct banks connecting the protected service water building with the Unit 3 auxiliary building; and conduit duct banks connecting manhole 7 to the standby shutdown facility cable trench and the standby shutdown facility trench to the standby shutdown facility.

System Intended Functions

Portions of the protected service water conduit duct banks perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the protected service water conduit duct banks are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the protected service water conduit duct banks are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the protected service water conduit duct banks are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the protected service water conduit duct banks can be found in UFSAR Sections 3.2, 9.7, and 9.7.3.5.

System Evaluation Boundaries

The evaluation boundary for the protected service water conduit duct banks includes the three conduit duct banks providing a path for electrical conductors from the protected service water building. It includes the reinforced concrete duct banks, the covers, and associated steel structural members. It does not include the technical support building cable vault, which is addressed in Section 2.4.7.9. It does not include the elevated raceway which is addressed as a bulk commodity, nor Manhole 7, which is addressed as manholes in Section 2.4.7.12. Likewise, the following items are addressed as bulk commodities in Section 2.4.8: equipment pads/ supports, piping supports, instrument supports, cable tray and conduit supports, electrical enclosures, piping penetrations, electrical penetrations, and heating and ventilation penetrations, fire barriers (fire seals, fire stops, fire wraps, coatings), seals and water stops.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the protected service water conduit duct banks is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-5, Protected Service Water Conduit Duct Banks.

Table 2.4.7-5 Protected Service Water Conduit Duct Banks

Structural Component	Intended Function
Anchors	Structural Support
Bolting (structural)	Structural Support
Concrete Elements: Concrete Elements (accessible) Concrete Elements (inaccessible)	Flood Barrier Missile Barrier Shelter, Protection Structural Support

Table 2.4.7-5 Protected Service Water Conduit Duct Banks

Structural Component	Intended Function
Steel Elements	Flood Barrier Missile Barrier Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-11, Containments, Structures, and Component Supports - Protected Service Water Conduit Duct Banks - Aging Management Evaluation.

2.4.7.6 Standby Shutdown Facility

System Description

The standby shutdown facility is designed as a standby system for use under extreme emergency conditions. The standby shutdown facility is provided as an alternate means to achieve and maintain shutdown conditions following postulated fire, sabotage, and flooding events, and is designed in accordance with criteria associated with these events. The standby shutdown facility structure is a reinforced concrete structure consisting of a diesel generator room, electrical equipment room, mechanical pump room, control room, central alarm station, and ventilation equipment room.

The standby shutdown facility structure is designed in accordance with ACI 318-71 for concrete. The structure utilizes ASTM A615-72, Grades 40 and 60 for concrete reinforcement and A36 for structural steel and plates. The standby shutdown facility foundation walls are waterproofed through the use of waterseals in the exterior construction joints to an elevation above the yard grade to prevent inflow of yard surface waters.

System Intended Functions

Portions of the standby shutdown facility perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the standby shutdown facility is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the standby shutdown facility structure contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. The standby shutdown facility structure provide structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of a function described in 10 CFR 54.4(a)(1). Therefore, the standby shutdown facility structure is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the standby shutdown facility structure are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the standby shutdown facility structure is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the standby shutdown facility structure can be found in UFSAR Sections 3.2, 3.2.1.1.1, 9.6, and 9.6.3.1.

System Evaluation Boundaries

The evaluation boundary for the standby shutdown facility includes the foundation, internal structural members, external walls and roof. Equipment pads/supports, piping supports, instrument supports, cable tray and conduit supports, and electrical enclosures are addressed as bulk commodities (Section 2.4.8) and are not included in the AMR for this structure. Piping penetrations, electrical penetrations, heating and ventilation penetrations, and fire barriers (fire seals, fire stops, fire wraps, coatings) are addressed as bulk commodities (Section 2.4.8).

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the standby shutdown facility is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-6, Standby Shutdown Facility.

Table 2.4.7-6 Standby Shutdown Facility

Structural Component	Intended Function
Anchors	Structural Support
Battery Racks	Structural Support
Bolting (structural)	Structural Support
Concrete Elements: Concrete Elements (accessible) Concrete Elements (inaccessible)	Flood Barrier Missile Barrier Shelter, Protection Structural Support

Table 2.4.7-6 Standby Shutdown Facility

Structural Component	Intended Function
Concrete Hatches	Missile Barrier Shelter, Protection Structural Support
Cranes: Rails, Bridges, Structural Members, Structural Components	Structural Support
Cranes: Structural Bolting	Structural Support
Doors	Flood Barrier Missile Barrier Shelter, Protection Structural Support
Roof Membrane	Shelter, Protection
Steel Elements	Flood Barrier Missile Barrier Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-12, Containments, Structures, and Component Supports - Standby Shutdown Facility - Aging Management Evaluation.

2.4.7.7 Radwaste Facility

System Description

The ONS radwaste facility consists of two separate adjoining structures, separated by a 3 inch expansion joint, both supported by poured in place reinforced concrete mats. One structure is primarily of reinforced concrete construction with structural walls serving also as shielding for radioactive components or materials. The other structure is primarily of braced structural steel construction with floors of reinforced concrete on metal deck and conventionally formed reinforced concrete columns and floors supporting large tanks. Exterior walls are insulated metal siding on steel girts. Interior walls are gypsum wallboard on metal studs and concrete masonry.

System Intended Functions

Portions of the radwaste facility are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the radwaste facility is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the radwaste facility can be found in UFSAR Sections 3.2, 3.8.5, 11.6, and 11.6.2.1.

System Evaluation Boundaries

The evaluation boundary for the radwaste facility includes the foundation, internal structural members, external walls and roof. Equipment pads/supports, piping supports, instrument supports, cable tray and conduit supports, and electrical enclosures are addressed as bulk commodities (Section 2.4.8), and are not included in the AMR for this structure. Piping penetrations, electrical penetrations, heating and ventilation penetrations, fire barriers (fire seals, fire stops, fire wraps, coatings), and structural expansion joints are addressed as bulk commodities (Section 2.4.8).

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the radwaste facility is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-7, Radwaste Facility.

Table 2.4.7-7 Radwaste Facility

Structural Component	Intended Function
Anchors	Structural Support
Bolting (structural)	Structural Support
Concrete Elements: Concrete Elements (accessible) Concrete Elements (inaccessible)	Shelter, Protection Structural Support

Table 2.4.7-7 Radwaste Facility

Structural Component	Intended Function
Doors	Shelter, Protection Structural Support
Masonry Walls	Shelter, Protection Structural Support
Roof Membrane	Shelter, Protection
Steel Elements	Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-13, Containments, Structures, and Component Supports - Radwaste Facility - Aging Management Evaluation.

2.4.7.8 Trenches

System Description

Trenches are provided throughout the ONS yard to allow underground routing of cables and piping. Trenches which are within the scope of SLR are the standby shutdown facility cable trench, emergency power path cable trench, the intake structure cable trench, the essential siphon vacuum system intake dike trench, the essential siphon vacuum system cable trench, the 115 kV switchyard cable trench, and the borated water storage tank pipe trench. The intended function of external concrete trenches are to provide shelter/protection for safety related equipment.

The standby shutdown facility cable trench, which carries electrical cables from the standby shutdown facility to each unit's auxiliary building, is a reinforced concrete structure. These cables are QA Condition 1 and require the seismic design and analysis of the cable trench so that the trench will safely survive the effects of earthquakes, missile loads, and truck loads. The cable trench is provided with missile proof vents so that the trench covers are not lifted by the 3 psi pressure differential. Vents are designed to protect the trench from flooding. Reinforced concrete covers are provided over the trench.

The cable trench for the emergency power path is laid out on a grid pattern which covers the entire 230 kV switchyard. It is a precast, reinforced concrete structure. The trench is drained by concrete drain tiles which run beneath it parallel to its centerline and it is covered by reinforced concrete panels. The trench is bedded in clean washed stone.

The cable trench to the intake structure is constructed of reinforced concrete. The cable trench supplying power to the condenser circulating water pump motors is qualified to withstand the maximum hypothetical earthquake seismic event.

The essential siphon vacuum system intake dike trench is constructed of reinforced concrete (bottom and walls). The covers for the trench are steel plate except at the roadway crossing. The covers at the roadway are removable reinforced concrete slabs. The essential siphon vacuum system intake dike trench routes the essential siphon vacuum piping, the siphon seal water piping, electrical heat trace cables, and electrical instrumentation cables.

The essential siphon vacuum system intake cable trench is constructed of reinforced concrete (bottom and walls). The covers for the trench are steel plate except at the traffic crossing. The covers at the crossing are removable reinforced concrete slabs. The essential siphon vacuum system cable trench routes the cables associated with the essential siphon vacuum system and siphon seal water system from the radwaste trench to the essential siphon vacuum building.

The 115 kV switchyard cable trench routes the cables from CT5 underneath the HP Office building into the auxiliary building. The cable trench is constructed of reinforced concrete and is qualified to withstand a maximum hypothetical earthquake seismic event.

The borated water storage tank pipe trench is a reinforced concrete structure. The borated water storage tank pipe trench is located between the auxiliary building and the borated water storage tank foundation. The auxiliary building foundation forms the east side trench wall.

System Intended Functions

Portions of the trenches perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the trenches are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the trenches contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. The trenches provide structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of a function described in 10 CFR 54.4(a)(1). Therefore, the trenches are within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the trenches structure are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the trenches are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the trenches can be found in UFSAR Sections 3.2 and 3.8.5.

System Evaluation Boundaries

The evaluation boundary for the trenches includes all the reinforced concrete trenches, structural steel, trench covers, and cover vents. It does not include piping supports, instrument supports, or cable tray and conduit supports which are addressed as bulk commodities (Section 2.4.8).

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the trenches is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-8, Trenches.

Table 2.4.7-8 Trenches

Structural Component	Intended Function
Anchors	Structural Support
Bolting (structural)	Structural Support
Concrete Elements: Concrete Elements (accessible) Concrete Elements (inaccessible)	Flood Barrier Missile Barrier Shelter, Protection Structural Support
Steel Elements	Flood Barrier Missile Barrier Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-14, Containments, Structures, and Component Supports - Trenches - Aging Management Evaluation.

2.4.7.9 Technical Support Building

System Description

The technical support building contains the technical support cable vault. The technical support building cable vault is constructed of reinforced concrete. The technical support building cable vault along with other duct banks and manhole 7 connect the protected service water building to the Unit 3 auxiliary building. No other portion of the technical support building performs an intended function.

System Intended Functions

Portions of the technical support building perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the technical support building structure is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the technical support building are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the technical support building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the technical support building can be found in UFSAR Sections 3.2, 3.8.5, 9.7, and 9.7.3.5.

System Evaluation Boundaries

The evaluation boundary for the technical support building is limited to the technical support building cable vault. It includes the reinforced concrete vault, internal structural members, and cable/conduit supports.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the technical support building is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-9, Technical Support Building.

Table 2.4.7-9 Technical Support Building Structure

Structural Component	Intended Function
Anchors	Structural Support
Bolting (structural)	Structural Support

Table 2.4.7-9 Technical Support Building Structure

Structural Component	Intended Function
Concrete Elements: Concrete Elements (accessible) Concrete Elements (inaccessible)	Flood Barrier Missile Barrier Shelter, Protection Structural Support
Steel Elements	Flood Barrier Missile Barrier Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-15, Containments, Structures, and Component Supports - Technical Support Building - Aging Management Evaluation.

2.4.7.10 Elevated Water Storage Tank Structure

System Description

The elevated water storage tank ensures an inventory of water for the high pressure service water system. The elevated water storage tank is a 100,000 gallon spherical atmospheric tank. The tank is designed to American Water Works Association Standard D-100, *Welded Steel Tanks for Water Storage*. The tank is supported on a cylindrical shaft and conical bell that is approximately 145 feet high. The cylindrical shaft and conical bell are ASTM A-283 Grade C plate material and A36 for structural steel. The bell is attached to the foundation by anchors which pass through an anchor chair and plate. Both the interior and exterior of the tank are coated to protect the steel from corrosion and loss of material. Materials, mixing, and placing of the concrete for the foundation were in accordance with the latest revision of ACI 318 at the time of construction.

System Intended Functions

Portions of the elevated water storage tank structure are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the elevated water storage tank structure is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the elevated water storage tank structure can be found in UFSAR Sections 3.2 and 3.8.5.

System Evaluation Boundaries

The evaluation boundaries of the elevated water storage tank include the cylindrical support shaft, anchor chair and plate assemblies. The pressure boundary portion of the elevated water storage tank is addressed as a mechanical item in Section 2.3.3.4.1, High Pressure Service Water. The tank foundation is addressed as a bulk commodity in Section 2.4.8.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the elevated water storage tank structure is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-10, Elevated Water Storage Tank Structure.

Table 2.4.7-10 Elevated Water Storage Tank Structure

Structural Component	Intended Function
Bolting (structural)	Structural Support
Steel Elements	Structural Support

The AMR results for these component types are indicated in Table 3.5.2-16, Containments, Structures, and Component Supports - Elevated Water Storage Tank Structure - Aging Management Evaluation.

2.4.7.11 Microwave House Structure

System Description

The Oconee microwave house structure is a small (16' X 10') building located approximately 100 yards northwest of the elevated water storage tank, at the base of the microwave tower superstructure and situated inside the microwave tower footings. The microwave house structure consists of aluminum sheet metal walls over a tube steel frame, supported by a concrete foundation. The roof has steel deck, covered with built up roofing. A single steel door provides access to the building.

System Intended Functions

Portions of the microwave house structure are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the microwave house structure is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the microwave house structure can be found in UFSAR Sections 2.3.3, 3.2, and 3.8.5.

System Evaluation Boundaries

The evaluation boundary for the microwave house structure includes the foundation, external walls, and roof. There are no internal walls in the building. The evaluation boundary does not include the microwave tower, tower footings, tower bolting, etc. Building insulation and heating ventilation and air conditioning are considered to perform no intended function. Equipment pads/ supports, piping supports, instrument supports, cable tray and conduit supports, and electrical enclosures are addressed as bulk commodities in Section 2.4.8.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the microwave house structure is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-11, Microwave House Structure.

Table 2.4.7-11 Microwave House Structure

Structural Component	Intended Function
Anchors	Structural Support
Bolting (structural)	Structural Support
Concrete Elements: Concrete Elements (accessible) Concrete Elements (inaccessible)	Shelter, Protection Structural Support
Doors	Shelter, Protection Structural Support

Table 2.4.7-11 Microwave House Structure

Structural Component	Intended Function
Metal Siding	Shelter, Protection
Roof Membrane	Shelter, Protection
Steel Elements	Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-17, Containments, Structures, and Component Supports - Microwave House Structure - Aging Management Evaluation.

2.4.7.12 Manholes

System Description

The yard contains manholes that perform an intended function and are in the scope of SLR. Manhole 7 is a new manhole, installed by the protected service water project, on the electrical path from the protected service water building to the Unit 3 auxiliary building. Manhole CMH-S1 is situated at the 100 kV switchyard before the cables from CT-5 go into the trench towards the auxiliary building. Manholes MCH-C3, CMH-C4, CMH-C5 and CMH-C6 are on the electrical path from the administration building to the microwave house. The cable routed through these manholes powers the air compressor for the elevated water storage tank level transmitter.

System Intended Functions

Portions of the manholes perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the manholes are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the manholes are relied upon for compliance with regulations for fire protection (10 CFR 50.48) and SBO (10 CFR 50.63). Therefore, the microwave house structure is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for manholes can be found in UFSAR Sections 3.2, 3.8.5, 9.7, and 9.7.3.5.

System Evaluation Boundaries

The evaluation boundary for the manholes is limited to Manhole 7, CMH-S1, CMH-C3, CMH-C4, CMH-C5 and CMH-C6. It includes the concrete manhole structure, internal structural members, and cable / conduit supports. It includes the concrete manhole structure, internal structural members, and cable/conduit supports. It does not include connected trenches / duct banks, which are addressed as separate yard structures (Section 2.4.7).

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for manholes is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-12, Manholes.

Table 2.4.7-12 Manholes

Structural Component	Intended Function
Anchors	Structural Support
Bolting (structural)	Structural Support
Concrete Elements: Concrete Elements (accessible) Concrete Elements (inaccessible)	Flood Barrier Missile Barrier Shelter, Protection Structural Support
Steel Elements	Flood Barrier Missile Barrier Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-18, Containments, Structures, and Component Supports - Manholes - Aging Management Evaluation.

2.4.7.13 Condenser Circulating Water Discharge Pipe

System Description

The condenser circulating water discharge pipe conveys water from the condenser to the discharge structure. The condenser circulating water pipes are fabricated from A283, Grade C steel, with A36 steel ring stiffeners located periodically along the length of pipe. The condenser circulating water discharge pipe does not perform a mechanical intended function and is evaluated as a structure.

System Intended Functions

Portions of the condenser circulating water discharge pipe contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the condenser circulating water discharge pipe provide structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of function described in 10 CFR 54.4(a)(1). Therefore, the condenser circulating water discharge pipe is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(2).

UFSAR References

Additional details for the condenser circulating water discharge pipe can be found in UFSAR Sections 3.2.1.1.2 and 3.8.5.1.

System Evaluation Boundaries

The evaluation boundary for the condenser circulating water discharge pipe starts where the portion of piping is embedded in the turbine building basemat and includes the downstream run to the discharge structure.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the condenser circulating water discharge pipe is listed below:

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-13, Condenser Circulating Water Discharge Pipe.

Table 2.4.7-13 Condenser Circulating Water Discharge Pipe

Structural Component	Intended Function
Piping Tunnel	Direct Flow Structural Support

The AMR results for these component types are indicated in Table 3.5.2-19, Containments, Structures, and Component Supports - Condenser Circulating Water Discharge Pipe - Aging Management Evaluation.

2.4.7.14 Health Physics Office Building

System Description

The health physics office building is a multi-story structure located adjacent to the Unit 3 auxiliary building with a cable trench, which contains 10 CFR 54.4(a)(1) cables, running beneath it. The health physics office building consists of a steel structure supported by reinforced concrete footers. The roof has steel deck, covered with built up roofing. The health physics office building is designed for the maximum hypothetical earthquake.

System Intended Functions

Portions of the health physics office building contains non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. Portions of the health physics office building provide structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of function described in 10 CFR 54.4(a)(1). Therefore, the health physics office building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(2).

UFSAR References

Additional details for the health physics office building can be found in UFSAR Sections 3.2 and 3.8.5.

System Evaluation Boundaries

The evaluation boundary for the health physics office building includes the footers, internal structural members, metal siding, and roof.

The penetrations, cable trays and conduit, electrical panels, equipment component supports, grout and building drains are addressed as bulk commodities (Section 2.4.8).

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the condenser circulating water discharge pipe is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-14, Health Physics Office Building.

Table 2.4.7-14 Health Physics Office Building

Structural Component	Intended Function
Anchor	Structural Support
Bolting (Structural)	Structural Support
Concrete Elements: Concrete Elements (accessible) Concrete Elements (inaccessible)	Structural Support
Doors	Structural Support
Metal Siding	Shelter, Protection
Roof Membrane	Shelter, Protection
Steel Elements	Shelter, Protection Structural Support

The AMR results for these component types are indicated in Table 3.5.2-20, Containments, Structures, and Component Supports - Health Physics Office Building - Aging Management Evaluation.

2.4.7.15 Administration Building

System Description

The administration building is located on the north side of the site adjacent to the security building. The administration building supports the electrical panel that provides electrical power to the air compressor for the elevated water storage tank level transmitter located in the microwave house, which serves a fire protection intended function. The administration building provides structural support for the electrical panel located on a masonry block wall, supported by a concrete foundation.

System Intended Functions

Portions of the administration building are relied upon for compliance with regulations for fire protection (10 CFR 50.48). Therefore, the administration building is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for the administration building can be found in UFSAR Sections 3.2 and 3.8.5.

System Evaluation Boundaries

The evaluation boundary for the administration building includes the foundation and the masonry block wall.

The cable trays, electrical panels, equipment component supports and grout are addressed as bulk commodities (Section 2.4.8). Additionally, the conduit that runs from the panel in the Administration Building to the air compressor for the elevated water storage tank level transmitter runs underground and is direct buried or encased in concrete in different locations. The conduit also enters four manholes along the route. This buried conduit is addressed in bulk commodities (Section 2.4.8). The manholes are addressed in Section 2.4.7.12.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the administration building is listed below:

- SLR-C-001, Oconee Nuclear Station Structural Boundary Drawing

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.7-15, Administration Building.

Table 2.4.7-15 Administration Building

Structural Component	Intended Function
Concrete Elements: Concrete Elements (accessible) Concrete Elements (inaccessible)	Structural Support
Masonry Wall	Structural Support

The AMR results for these component types are indicated in Table 3.5.2-21, Containments, Structures, and Component Supports - Administration Building - Aging Management Evaluation.

2.4.8 BULK COMMODITIES

2.4.8.1 Component Supports

System Description

Component supports for mechanical and electrical components are an integral part of all plant systems. These supports are not uniquely identified; however, component supports exhibit similar characteristics such as design, materials of construction, environments, and aging. Therefore, component supports for mechanical and electrical components are evaluated as plant structural commodities.

The commodity evaluation applies to supports for mechanical and electrical components within the structures that are in scope for SLR.

- Pipe supports, includes ASME piping and non-ASME piping. The fuel transfer tube is classified as ASME piping, and as such its support is evaluated with ASME piping.
- Cable trays, conduit, tubetracks, instrument tubing, and associated supports
- Instrument Line Supports
- Supports for panels, cabinets and enclosures for control boards, electrical equipment and instrumentation
- Miscellaneous equipment supports

Also included in the scope of component supports are the supports for the Class 1 piping and reactor coolant system components, as stated below.

Hot and Cold Leg Piping (NPS > 14 inches)

The primary hot and cold legs are 36 inch and 28 inch, respectively, clad carbon steel pipes that are supported by the reactor vessel and steam generator. Each reactor coolant pump is supported by the cold leg piping and the weight of each reactor coolant pump motor is supported by constant load supports.

Loss of coolant accident restraints surround each hot leg: one at the 90-degree elbow that directs coolant flow to the vertical riser section, and two that envelop the vertical riser. Each cold leg contains a loss of coolant accident restraint located at the reactor coolant pump inlet. All loss of coolant accident restraints are shimmed such that a gap exists between the restraint and the piping during all modes of operation. With the approval of leak-before-break for the hot and cold leg piping, loss of coolant accident restraints are no longer necessary to prevent pipe whip following a postulated double-ended rupture of the cold leg. However, degradation of the loss of coolant accident restraints, which could cause interference between the restraint and piping, may result in unanalyzed piping stresses. Since the loss of coolant accident restraints have not been removed, and their failure could affect the integrity of the reactor coolant system piping, the loss of coolant accident restraints will be subject to AMR. Items subject to AMR are the structural members used to construct the loss of coolant accident restraints, including the exposed portion of the connection (i.e., welded or bolted) to the building structure.

Piping NPS ≤ 14 Inches

Class 1 piping less than 14 inches NPS includes the decay heat drop line, core flood decay heat injection lines, pressurizer surge line, pressurizer spray and auxiliary spray lines, high point vent makeup lines, letdown lines, vent and drain lines, instrumentation lines, and incore monitoring system piping. Pipe supports cover the entire range of structural elements which perform the function of carrying the weight of a piping system and/or providing them with structural stability. The various types of pipe supports include:

- Rigid type supports (single acting)
- Rigid type supports (double acting)
- Constant support spring hangers
- Variable support spring hangers
- Anchors
- Guides and stops
- Restraints
- Snubbers

Although snubbers are excluded from AMR by 10 CFR 54.21(a)(1)(i) because they are active, the items that mount the snubber to the pipe and to the structure are included within the scope of SLR and require AMR.

Pipe supports are generally constructed of a standard support, a structural frame, or some combination of the two. A standard support is an assembly consisting of one or more units usually referred to as a catalogue item and generally mass produced. Pipe support frames generally are constructed of A36 structural steel or A500 Grade B tube shapes. The boundary of the pipe support extends from the attachment to the pipe back to the attachment to the supporting structure.

Pressurizer

The pressurizer supports include support plate assemblies, support frame assembly, and the pressurizer loss of coolant accident restraint. The pressurizer is supported by 8 support pads spaced symmetrically around the circumference of the vessel. Lateral support is provided by means of a structural tie to the shield wall.

Reactor Vessel Supports

Supports attached to the reactor vessel that are subject to aging management review include the control rod drive service structure and the reactor vessel support skirt. The reactor vessel is supported by a cylindrical skirt. These supports are rigidly attached to the vessels and bolted to the foundation by means of an integral base plate.

Steam Generator Skirt and Upper Lateral Support

The steam generators are supported by a conical stool. These supports are rigidly attached to the vessels and bolted to the foundation by means of an integral base plate. Lateral support is provided for the steam generator at the upper tubesheet level by means of a structural tie to the secondary shield wall.

Reactor Coolant Pump Supports – Lateral and Vertical Support Assemblies

The reactor coolant pump supports include vertical and lateral support assemblies. The reactor coolant piping is self-supporting with respect to deadweight, seismic, and thermal loading. The reactor coolant pumps are partially supported by rod hangers which are designed to support the dead weight of the pump motor, with the remainder of the dead weight of the pump being supported by the piping. To reduce seismic deflection, the pumps are supported laterally at the motor by means of hydraulic suppressors connected to the secondary shield wall.

System Intended Functions

Portions of the component supports perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the component supports are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the component supports contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. The component supports provide structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of a function described in 10 CFR 54.4(a)(1). Therefore, the component supports are within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the component supports are relied upon for compliance with regulations for fire protection (10 CFR 50.48), SBO (10 CFR 50.63), and ATWS (10 CFR 50.62). Therefore, the component supports are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for component supports can be found in UFSAR Sections 3.9.3, 3.9.3.4, and 3.10.

System Evaluation Boundaries

The evaluation boundary for component supports includes structural supports for all mechanical (including the fuel transfer tube) and electrical components that are within the scope of SLR. Additionally, supports that restrain components that are not within the scope of SLR but are located in buildings that contain safety related SSCs are within the evaluation boundary. The components that comprise the supports within the evaluation boundary include anchors, bolting, spring hangers, guides, stops, sliding surfaces, structural support members (aluminum elements, stainless steel elements and steel elements) and wear plates. The evaluation boundary lies between equipment or component being supported and the building-supporting structure. Conduits, cable trays and raceways are also included within the evaluation boundary for component supports. The reactor vessel support skirt and steam generator conical stool are evaluated in Section 2.3.1.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for the component supports is listed below:

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.8-1, Component Supports.

Table 2.4.8-1 Component Supports

Structural Component	Intended Function
Aluminum Elements	Structural Support
Anchors	Structural Support
ASME Piping: Anchorage	Structural Support
ASME Piping: Bolting (structural)	Structural Support

Table 2.4.8-1 Component Supports

Structural Component	Intended Function
ASME Piping: Sliding Surfaces	Structural Support
ASME Piping: Spring Hangers, Guides and Stops	Structural Support
ASME Piping: Support Members	Structural Support
Bolting (structural)	Structural Support
Conduit	Shelter, Protection
Reactor Coolant System Support: Anchorage	Structural Support
Reactor Coolant System Support: Bolting (structural)	Structural Support
Reactor Coolant System Support: Sliding Surfaces	Structural Support
Reactor Coolant System Support: Spring Hangers, Guides and Stops	Structural Support
Reactor Coolant System Support: Support Members	Structural Support
Stainless Steel Elements	Structural Support
Steel Elements	Structural Support
Wear Plate	Shelter, Protection

The AMR results for these component types are indicated in Table 3.5.2-22, Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation.

2.4.8.2 Miscellaneous Structural Commodities

System Description

Building and structures within the scope of SLR contain miscellaneous structural commodities that are within the scope of SLR and are subject to AMR.

The following miscellaneous structural commodities have been identified as being within the scope of SLR and subject to AMR.

- Concrete Elements (Valve Pits, Yard Foundations, and Transformer Equipment Pads)
- Drains/Curbs
- Electrical Enclosures
- Fire Barrier - Penetration Seals
- Grout/Concrete for Equipment Anchorage
- Penetration Sleeves and Seals, including Louvers
- Piles, Pipe Piles, Foundation Dowels
- Seismic Gap Filler Material and Covers
- Vibrations Isolators

The concrete elements consist of the foundations for the borated water storage tank superstructure, elevated water storage tank, microwave building, transformer pads for the Keowee main step-up transformer and ONS CT1, CT2 and CT3 transformers, the Unit 3 6.9 kV switchgear and condenser circulating water valve pits (yard foundations, valve pits, and transformer equipment pads).

Drains/curbs include buildings that have either a roof drain system or gutters and downspouts for precipitation which connect to the yard drain system or which drain to the surface. Also included are curbs that are used to direct flow.

Electrical enclosures include bus duct and switchgear enclosures (including the Unit 3 6.9 kV switchgear enclosure), electrical panels and cabinets, junction, terminal, and pull boxes. The electrical panels and cabinets contain supports for electrical components located inside the enclosure.

Fire barriers are located in safety and non-safety buildings to protect equipment within the scope of SLR from fire. Cork is installed in the seismic gap between the reactor and auxiliary buildings. Cork is considered a fire barrier in the east and west penetration room (of each unit). The cork is covered with a fire- and water-resistant caulking material. The NRC has accepted this cork as a fire barrier and has exempted it from testing and rating requirements normally required for fire barriers. Armaflex is a flexible insulation material which is installed in penetrations in the floor and ceiling of east and west penetration rooms (of each unit) for pressure boundary conditions. The NRC has accepted Armaflex as a fire barrier and has exempted it from testing and rating requirements normally required for fire barriers.

Building and equipment anchorage includes grouted bolts and wedge anchors, which are located in both safety and non-safety buildings. The grout/concrete plays a significant role and contributes to anchor capacity.

Penetration sleeves are located in openings of walls, floors, roofs, or ceilings and allow components such as piping, conduits, duct banks, and tubing to be routed through the opening. Penetration seals are materials that are used to seal the penetration. Louver framing located within the walls serve a passive structural support function and are evaluated with the penetration sleeves.

Various structures are supported by piles, foundation dowels, or pipe piles. Piles and pipe piles are used under certain structures to transfer foundation loadings to greater depths below grade. The function of the piles is to support superimposed structural loads and to transfer the structural loads to soil or rock of good bearing capacity. Foundation dowels tie building foundation to bedrock.

Seismic gaps are provided between adjacent structures to allow for relative motion between the structures. Although there are different configurations, the seismic gaps are arranged to prevent material from entering the gap space since the intrusion of foreign materials may impede the relative motion of adjacent structures. In most configurations, the seismic gaps are covered by structural angles or other elements such as elastomer seals, and the seismic gaps are filled with a compressible material.

Vibration isolators are utilized to isolate sensitive equipment from mechanical vibrations. The vibration isolators ensure that dynamic loads are not transferred to the equipment.

Structure Intended Functions

Portions of the miscellaneous structural commodities perform safety related functions by providing structural support, and shelter and protection for safety related SSCs required to mitigate the consequences of design basis events. Therefore, the miscellaneous structural commodities are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1).

Portions of the miscellaneous structural commodities contain non-safety related components whose failure could prevent satisfactory accomplishment of a 10 CFR 54.4(a)(1) function. The component supports provide structural support, and shelter and protection for non-safety related SSCs whose failure could prevent performance of a function described in 10 CFR 54.4(a)(1). Therefore, the miscellaneous structural commodities are within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2).

Portions of the miscellaneous structural commodities are relied upon for compliance with regulations for fire protection (10 CFR 50.48), SBO (10 CFR 50.63), and ATWS (10 CFR 50.62). Therefore, the miscellaneous structural commodities are within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for miscellaneous structural commodities can be found in UFSAR Sections 3.2 and 11.6.3.7.

System Evaluation Boundaries

The evaluation boundary for miscellaneous structural commodities includes the concrete elements (valve pits, yard foundations, and transformer pads), drain/curbs, electrical enclosures, fire barriers, grout, penetration seals, penetration sleeves, piles, seismic gap filler material and covers, and vibration isolators in the buildings and structures that are within the scope of SLR.

Fire barrier walls, floors, doors, and ceilings are evaluated with the individual structures in which they are installed. The portions of the anchors exposed to the air environment are evaluated with the building.

Subsequent License Renewal Boundary Drawing

The SLR boundary drawing for miscellaneous structural commodities is listed below:

- None

Components Subject to Aging Management Review

The component types subject to AMR are indicated in Table 2.4.8-2, Miscellaneous Structural Commodities.

Table 2.4.8-2 Miscellaneous Structural Commodities

Structural Component	Intended Function
Concrete Elements Concrete Elements (Accessible) Concrete Elements (Inaccessible)	Structural Support
Drains/Curbs	Direct Flow
Electrical Enclosure	Structural Support Shelter, Protection
Fire Barrier - Penetration Seals	Fire Barrier
Grout	Structural Support

Table 2.4.8-2 Miscellaneous Structural Commodities

Structural Component	Intended Function
Penetration Seals	Flood Barrier
Penetration Sleeves	Structural Support
Piles	Structural Support
Seismic Gap Covers	Shelter, Protection
Seismic Gap Filler Material	Fire Barrier Shelter, Protection
Vibration Isolator	Structural Support

The AMR results for these component types are indicated in Table 3.5.2-23, Containments, Structures, and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation.

2.5 SCOPING AND SCREENING RESULTS: ELECTRICAL AND INSTRUMENTATION AND CONTROLS

Section 2.1.5.1 provides the screening methodology for determining which electrical components and commodity groups within the scope of 10 CFR 54.4 meet the requirements contained in 10 CFR 54.21(a)(1). The electrical commodity groups that meet those screening requirements are identified in this section. These identified electrical commodity groups consequently require an AMR.

Components which support or interface with electrical and I&C components, for example, cable trays, conduits, instrument racks panels and enclosures, are assessed as part of the component supports commodity group in Section 2.4.8.

Identification of Electrical and Instrumentation and Control Component Commodities

The first step in the screening process for electrical and I&C components is to identify electrical component commodities within the electrical, I&C, and mechanical systems based on plant design documents as well as by interfacing with the parallel mechanical and civil screening efforts. Commodity groups are used for screening the electrical and I&C components for SLR. A component commodity group is a group of components which are categorized by type or function. For example, electrical and I&C cables are grouped together and connectors are included in this group because their function is similar. Likewise, all transmitters are grouped together because their component type is similar, despite differences in the generic function of indication (level, flow, differential pressure, etc.). The same is true for motors, switchgear, and other electrical and I&C components. ONS electrical and I&C component commodity groups are listed below.

- Alarm Units
- Analyzers
- Annunciators
- Batteries
- Cable Tie Wraps
- Conductors and Connections (including splices and terminal blocks)
  - Cable Connections (metallic parts)
  - Connector Contacts for Electrical Connections Exposed to Borated Water Leakage
  - Insulation for Electrical Cables and Connections
  - Electrical and I&C Containment Penetrations (including pigtails)
  - Fuses
  - Fuse Holders (not part of active equipment)
  - Metal Enclosed Bus (metal enclosed bus, isolated-, segregated, and non-segregated phase)
  - Switchyard Bus and Connections
  - Transmission Conductors and Connections
  - Uninsulated Ground Conductors
- Chargers
- Circuit Breakers

- Communication Equipment
- Computers
- Converters
- Electric Heaters
- Electrical Controls and Panel Internal Component Assemblies
- Elements, RTDs, Sensors, Thermocouples, Transducers
- Generators, Motors
- Heat Tracing
- High Voltage Insulators
- Indicators
- Inverters
- Isolators
- Light Bulbs
- Loop Controllers
- Meters
- Power Supplies
- Radiation Monitors
- Recorders
- Regulators
- Relays
- Signal Conditioners
- Solenoid Operators
- Solid State Devices
- Surge Arresters
- Switches
- Switchgear, Load Centers, Motor Control Centers, Distribution Panels
- Transformers
- Transmitters

Application of Screening Criterion 10 CFR 54.21(a)(1)(i) to the Electrical and I&C Component Commodities

Following identification of electrical and I&C component commodity groups, the criteria of 10 CFR 54.21(a)(1)(i) were applied to identify component commodity groups that perform their functions without moving parts or without a change in configuration or properties. The following electrical commodities were determined to meet the screening criteria of 10 CFR 54.21(a)(1)(i):

- Cable Connections (Metallic Parts)
- Connector contacts for electrical connections exposed to borated water leakage
- Insulation for Electrical Cables and Connections
- Electrical and I&C Containment Penetrations (including pigtails)
- Fuse Holders (not part of active equipment)
- Metal Enclosed Bus (isolated, segregated, and non-segregated phase)
- Switchyard Bus and Connections
- Transmission Conductors and Connections
- Uninsulated Ground Conductors
- High Voltage Insulators
- Cable Tie Wraps

Elimination of Electrical and I&C Commodity Groups Without a License Renewal Intended Functions

From the above list of "passive" electrical and I&C component commodities, uninsulated ground conductors and cable tie wraps were determined to not have a SLR intended function, and thus can be eliminated from the AMR. The basis for this determination is as follows.

Uninsulated Ground Conductors

The uninsulated ground conductors commodity group is comprised of bare metallic grounding conductors and associated connectors. Uninsulated ground conductors are connected to electrical equipment enclosures as well as metal structural features such as the cable tray system and building structural steel. Uninsulated ground conductors enhance the capability of the electrical system to withstand electrical disturbances (e.g., electrical faults, lightning surges) for equipment and personnel protection. Uninsulated ground conductors are always isolated or insulated from the electrical operating circuits. As they are not part of the electrical operating circuits, uninsulated ground conductors do not perform an intended function for SLR per 10 CFR 54.4. They are not relied upon to remain functional during or following any design basis event. Therefore, uninsulated ground conductors are not within the scope of SLR and are not subject to AMR.

Cable Tie Wraps

Tie wraps are used in cable installations as cable ties. Cable ties hold groups of cables together for restraint and ease of maintenance. Cable ties are used to bundle wires and cables together to keep the wire and cable runs neat and orderly. Cable ties are used to restrain wires and cables within raceways to facilitate cable installation. There are no current license basis requirements for ONS that cable tie wraps remain functional during and following design basis events. Cable ties are not credited for maintaining cable ampacity, ensuring maintenance of cable minimum bending radius, or maintaining cables within vertical raceways at ONS. The seismic qualification of cable trays does not credit the use of cable ties. Cable tie wraps are not credited in the ONS design basis in terms of any 10 CFR 54.4 intended function. Therefore, cable tie wraps are not within the scope of SLR and therefore, are not subject to AMR.

Application of Screening Criteria 10 CFR 54.21(a)(1)(ii) to Electrical and I&C Commodity Groups

After the "passive" screening and the non-SLR intended function eliminations, the "long-lived" screening criterion of 10 CFR 54.21(a)(1)(ii) was applied to the remaining list of electrical and I&C components commodity groups. 10 CFR 54.21(a)(1)(ii) allows the exclusion of those commodities that are subject to replacement based on a qualified life or specified time period. The electrical commodities identified for exclusion by the 10 CFR 54.21(a)(1)(ii) criterion are electrical and I&C component commodities included in the EQ of electric equipment AMP (per 10 CFR 50.49). Electrical and I&C components and commodities included in the EQ Program have defined qualified lives and are replaced prior to the expiration of their qualified lives. Therefore, no electrical and I&C components and commodities within the EQ Program are subject to an

AMR in accordance with the screening criteria of 10 CFR 54.21(a)(1)(ii). See Section 4.4 for the TLAA evaluation of the EQ of electric equipment AMP.

Electrical and I&C components that are replaced based on a period of any time length may be excluded from the AMR because they do not meet the 10 CFR 54.21(a)(1)(ii) criterion. Components with lifetimes measured in operating cycles also apply to this criterion; but this 'cycles' parameter involves active components (such as breakers, switches, etc.) that are not subject to the AMR.

Some of the electrical containment penetrations are environmentally qualified per 10 CFR 50.49. These electrical penetrations are evaluated as a TLAA and are managed by the EQ program per B3.3. For the remainder of the electrical containment penetrations, the electrical continuity of their pigtails (leads) and associated connections that could potentially be exposed to an adverse localized environment is included in the evaluation for the electrical insulation material for electrical cables and connections component group under the cables and connections commodity group in Section 2.5.1. The pressure boundary and structural support intended functions of electrical penetrations are included in the evaluation for containment in Section 2.4.2.

2.5.1 ELECTRICAL AND INSTRUMENTATION AND CONTROL COMPONENT COMMODITY GROUPS

The electrical commodities subject to AMR are identified in Table 2.5.1-1, along with the associated intended functions. These electrical commodities are further described below.

2.5.1.1 Cable and Connections

This electrical commodity group includes the following electrical and I&C component groups:

- Cable Connections (Metallic Parts)
- Connector Contacts for Electrical Connections Exposed to Borated Water Leakage
- Insulation for Cable and Connections

Many insulated cables and connections are included in the EQ program and, thus, are not subject to AMR per the screening criteria of 10 CFR 54.21(a)(1)(ii). Insulated cables and connections that are not included in the EQ program meet the criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an AMR. The electrical and I&C components included within these commodity groups consist of electrical conductors and termination devices that deliver voltage, current, and/or signals from sources to application devices, and are passive in nature. The electrical cable and connection subcomponents are further described below:

<u>Cable Connections (Metallic Parts)</u>

This component commodity group is comprised of metallic portions of electrical and I&C connections that are not included in the EQ program. These include compression type terminal lugs, splices, bolted connections, terminal blocks, and threaded connectors.

Connector Contacts for Electrical Connections Exposed to Borated Water Leakage

The component commodity group includes connector contacts such as pins, sockets, or other metallic connectors that are not included in the EQ program and that are exposed to borated water leakage.

Insulation for Cable and Connections

The insulation for electrical and I&C cables and connections commodity group includes insulation material, typically extruded or taped polymers, for the following component groups that are not included in the EQ program:

- Insulation for electrical cables and connections
- Insulation for electrical cables and connections used in instrumentation circuits
- Insulation for inaccessible medium-voltage cable
- Insulation for inaccessible I&C cable
- Insulation for Inaccessible low voltage power cable

These subdivisions by applications and environments are consistent with their treatment in NUREG-2191 for AMR. The above component groups are limited to the insulation for cables and connections that are passive per 10 CFR 54.21(a)(1)(i) and thus not within or part of active equipment. Cables and connections inside the enclosure of an active device (e.g., motor leads and connections, cables and connections internal to relays, chargers, switchgear, transformers, power supplies) are maintained along with the other subcomponents inside the enclosure and are not subject to an AMR.

2.5.1.2 Fuse Holders (Not Part Of Active Equipment)

As a unique type of the terminal block commodities, a fuse holder is a passive component that makes a connection between conductors and a fuse, which itself is an active circuit-controlling device. Fuse holders are typically constructed of metallic clamps that include polymer-based electrical insulation.

Insulation

The fuse holders - not part of active equipment (insulation) component group subject to an AMR includes fuse holders that are not part of active larger equipment assemblies such as motor control centers, load centers, or switchgear and are not included in the EQ program. The insulation material for these fuse holders includes the mounting block for metallic components.

Metallic Clamps

The fuse holders - not part of active equipment (metallic clamps) component group subject to an AMR includes fuse holders that are not part of active larger equipment assemblies and are not included in the EQ program. The metallic portions of these fuse holders include spring-loaded clips and bolted lugs to connect the fuse ends.

2.5.1.3 Metal Enclosed Bus

Metal enclosed bus commodity group includes current-carrying metallic bus bars that are enclosed within a protective metallic duct or housing, either on a per-phase basis (i.e. iso-phase bus) or around all three power phases collectively with or without metal barriers between phase conductors (i.e. segregated or non-segregated phase bus, respectively). Metal enclosed bus construction also includes bus insulation and insulators from structural supports. Keowee hydro station, the ONS emergency power supply, uses all three metal enclosed bus types; and the ONS units use all types except segregated phase bus. Since some ONS metal enclosed bus sections feed power circuits within the scope of SLR and are not EQ equipment and are not part of active components such as switchgear, load centers, or motor control centers, these metal enclosed bus commodities meet the 10 CFR 54.21(a)(1)(i and ii) screening criteria and are subject to the AMR. Structural supports that hold metal enclosed bus are evaluated in Section 2.4.

2.5.1.4 Switchyard Bus and Connections

The switchyard bus and connections component commodity group includes uninsulated rigid-conductor and connection portions of the overhead ONS 230 kV switchyard and 100 kV switching-station circuits that supply power from the electric transmission system to plant buses, including power circuits that are credited for recovery of offsite power following an SBO event.

The following are included in the AMR for switchyard bus and connections:

- All switchyard bus and connections in the 230 kV switchyard
- All switchyard bus and connections in the 100 kV switching station

The switchyard bus and connections are passive and not included in the EQ program; and they provide the basic intended function of electrical continuity. They meet the screening criteria of 10 CFR 54.21(a)(1)(i and ii) and are subject to AMR.

2.5.1.5 Transmission Conductors and Connections

The transmission conductors and connectors component commodity group includes uninsulated stranded-conductor and connection portions of the overhead 230 kV switchyard and 100 kV switching-station circuits that supply power from the electric transmission system to plant buses, including power circuits that are credited for recovery of offsite power following an SBO event.

The following are included in the AMR for transmission conductors:

- Transmission conductors in the 230 kV switchyard
- Transmission conductors in the Keowee 230 kV transformer yard
- Transmission conductors in the Oconee transformer yard
- Transmission conductors in the Keowee 230 kV transmission line
- Transmission conductors in the 100 kV Fant black line
- Transmission conductors in the 100 kV switching station

The transmission conductors and connectors are passive and not included in the EQ program; and they provide the basic intended function of electrical continuity. They meet the screening criteria of 10 CFR 54.21(a)(1)(i and ii) and are subject to AMR.

2.5.1.6 High Voltage Insulators

The high voltage insulators component commodity group includes rigid station post insulators and more flexible strain and suspension insulators that support and insulate overhead transmission conductors and switchyard bus. These insulators are part of the 230 kV switchyard and 100 kV switching-station circuits that supply power from the electric transmission system to plant buses, including power circuits that are credited for recovery of offsite power following an SBO event.

The following are included in the AMR for transmission conductors:

- High voltage insulators supporting bus and conductors in the 230 kV switchyard
- High voltage insulators supporting conductors in the Keowee 230 kV transformer yard
- High voltage insulators supporting 230 kV conductors in the Oconee transformer yard
- High voltage insulators supporting the Keowee 230 kV transmission line
- High voltage insulators supporting the 100 kV Fant black line
- High voltage insulators supporting bus and conductors in the 100 kV switching station

The high voltage insulators are passive and not included in the EQ program. They provide the basic intended function of electrical insulation.

Table 2.5.1-1 Electrical and Instrumentation and Controls Commodities

Electrical and Instrumentation and Controls Commodities	Intended Functions
Cable Connections (metallic parts)	Electrical Continuity
Connector Contacts for Electrical Connections Exposed to Borated Water Leakage	Electrical Continuity
Insulation for Electrical Cable and Connections	Electrical Insulation
Insulation for Electrical Cables and Connections used in Instrumentation Circuits	Electrical Insulation
Insulation for Inaccessible Medium-Voltage Power Cables	Electrical Insulation
Insulation for Inaccessible Instrument and Control Cables	Electrical Insulation

Table 2.5.1-1 Electrical and Instrumentation and Controls Commodities

Electrical and Instrumentation and Controls Commodities	Intended Functions
Insulation for Inaccessible Low-Voltage Power Cables	Electrical Insulation
Fuse Holders - Not Part of Active Equipment (insulation)	Electrical Insulation
Fuse Holders - Not Part of Active Equipment (metallic clamps)	Electrical Continuity
Metal Enclosed Bus (insulation, insulators)	Electrical Insulation
Metal Enclosed Bus (bus and connections)	Electrical Continuity
Metal Enclosed Bus (enclosure assemblies)	Shelter, Protection
Switchyard Bus and Connections	Electrical Continuity
Transmission Conductors and Connections	Electrical Continuity
High Voltage Insulators	Electrical Insulation

The AMR results for these component types are indicated in Table 3.6.2-1, Electrical, Instrumentation and Controls Commodities - Aging Management Evaluation.

2.5.2 APPLICATION OF 10 CFR 54.4(a) SCOPING CRITERIA TO ELECTRICAL COMPONENTS

The basic philosophy used in the electrical and I&C component scoping and screening process is that all plant electrical and I&C components are included in the AMR unless they are specifically scoped out per 10 CFR 54.4 or screened-out per 10 CFR 54.21(a)(1). The 10 CFR 54.4(a) scoping criteria is applied only to specific electrical and I&C components that are scoped out. This method contrasts with the approach of applying the scoping criteria to all electrical and I&C components to determine those that are scoped in. This more efficient and flexible process of selective 10 CFR 54.4 scoping is described in NUREG-2192 under its '*Key Points for Electrical Scoping*'. The section indicates that significant efficiencies can be gained by delaying such selective 10 CFR 54.4 scoping until after the larger reduction of 10 CFR 54.21(a)(1) screening as provided above in Section 2.5.

The 10 CFR 54.4(a) scoping criteria is applied to the following selected electrical components that are scoped out:

- Electrical components associated with the 525 kV switchyard which provides three transmission lines to the Duke Energy transmission grid and a connection between switchyards through a 230/525 kV autotransformer.
- Electrical components associated with the Jocassee, Calhoun, Oconee, and Dacus 230 kV transmission lines which serve to connect ONS with the remainder of the Duke Energy 230 kV transmission system.
- Electrical components associated with the Radwaste Facility that serve to process radioactive waste before shipment offsite.
- Electrical components associated with the 44 kV Oconee retail substation.
- Electrical components associated with various plant structures without a 10 CFR 54.4(a) function (i.e., structures that are not within the scope of SLR per Table 2.2-2).

The electrical components described above are not relied upon to remain functional during or following a design basis event. The electrical components are not relied upon to support any functions identified in 10 CFR 54.4(a)(1).

The electrical components described above are not relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the regulations for fire protection (10 CFR 50.48), PTS (10 CFR 50.61), EQ (10 CFR 50.49), ATWS (10 CFR 50.62), and SBO (10 CFR 50.63). The electrical components are not relied upon to support any functions identified in 10 CFR 54.4(a)(3). Note that the radwaste building is in the scope of SLR for fire protection (10 CFR 50.48) due to fire hose stations located in the structure. These fire hose stations are manually operated components with no accompanying electrical equipment required for their operation. They are addressed in Section 2.4.7.7.

3.0 AGING MANAGEMENT REVIEW RESULTS

This chapter provides the results of the AMR for those mechanical systems, structures, and electrical and I&C components identified in Section 2.2 as being subject to AMR.

Organization of this chapter is based on Tables 3.1-1 through 3.6-1 of NUREG-2192, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants”.

The major sections of this chapter are:

- Aging Management of Reactor Vessel, Reactor Internals, and Reactor Coolant System (Section 3.1)
- Aging Management of Engineered Safety Features (Section 3.2)
- Aging Management of Auxiliary Systems (Section 3.3)
- Aging Management of Steam and Power Conversion System (Section 3.4)
- Aging Management of Containments, Structures, and Component Supports (Section 3.5)
- Aging Management of Electrical and Instrumentation and Controls (Section 3.6)

Descriptions of the service environments that were used in the mechanical systems, electrical, and structural AMRs to determine aging effects requiring management are included in Table 3.0-1, Oconee Nuclear Station Service Environments. The environments used in the AMRs are listed in the environment column. The third column identifies one or more of the NUREG-2191, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,” (Reference 1.7-4) environments that were used when comparing the ONS AMR results to the NUREG-2191 results. The definitions of those environments correspond to the definitions in NUREG-2191, Section IX.D. Note that Table 3.0-1 includes all electrical environments except “10 CFR 50.49 Environments”. These environments are not defined in NUREG-2191, Section XI.D.

Most of the AMR results information in Section 3 is presented in the following two tables:

Table 3.x.1 - where '3' indicates the SLRA section number, 'x' indicates the subsection number from NUREG-2191, and '1' indicates that this is the first table type in Section 3. For example, in the Reactor Vessel, Internals, and Reactor Coolant System subsection, this table would be number 3.1.1, in the Engineered Safety Features subsection, this table would be 3.2.1, and so on. For ease of discussion, this table will, hereafter, be referred to in this section as “Table 1.”

Table 3.x.2-y - where '3' indicates the SLRA section number, 'x' indicates the subsection number from NUREG-2191, and '2' indicates that this is the second table type in Section 3; and 'y' indicates the table number for a specific system. For example, for the reactor vessel, within the Reactor Vessel, Internals, and Reactor Coolant System subsection, this table would be 3.1.2-1 and for the reactor vessel internals, it would be Table 3.1.2-2. For the containment spray system, within the engineered safety features subsection, this table would be 3.2.2-1. For the next system within the engineered safety features subsection, it would be Table 3.2.2-2. For ease of discussion, this table will, hereafter, be referred to in this section as Table 2.

Table Description

NUREG-2191, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,” contains the generic evaluation of existing plant programs. It documents the technical basis for determining where existing programs are adequate without modification, and where existing programs should be augmented for the second extended period of operation. The evaluation results documented in NUREG-2191 indicate that many of the existing programs are adequate to manage the aging effects for particular structures or components, within the scope of license renewal, without change. NUREG-2191 also contains recommendations on specific areas for which existing programs should be enhanced for license renewal. In order to take full advantage of NUREG-2191, a comparison between the AMR results and the tables of NUREG-2191 has been performed. The results of that comparison are provided in Table 1 and Table 2.

Table 1

The purpose of Table 1 is to provide a summary comparison of how the facility aligns with the corresponding tables of NUREG-2192. The table is essentially the same as Tables 3.1-1 through 3.6-1 provided in NUREG-2192, except that the “New, Modified, Deleted, Edited Item,” “ID” and “Type” columns have been replaced by an “Item Number” column, and the “GALL-SLR Item” column has been replaced by a “Discussion” column.

The “Item Number” column provides the reviewer with a means to cross-reference from Table 2 to Table 1.

The “Discussion” column is used to provide clarifying or amplifying information. The following are examples of information that might be contained within this column:

- “Further Evaluation Recommended” information or reference to where that information is located.
- The name of a plant specific AMP being used, if applicable.
- Exceptions to the NUREG-2191 assumptions, if applicable.
- A discussion of how the line is consistent with the corresponding line item in NUREG-2191, when that may not be intuitively obvious.
- A discussion of how the item is different than the corresponding line item in NUREG-2191 when it may appear to be consistent (e.g., when there is exception taken to an AMP that is listed in NUREG-2191), if applicable.

The format of Table 1 provides the reviewer with a means of aligning a specific Table 1 row with the corresponding NUREG-2191 table row, thereby allowing for the ease of checking consistency.

Table 2

Table 2 provides the detailed results of the AMRs for those components identified in SLRA Section 2 as being subject to AMR. There is a Table 2 for each of the systems within a Chapter 3 section grouping. For example, the engineered safety features system group contains table specific to the reactor building spray system, core flood system, high pressure injection system, and low pressure injection system. Table 2 consists of the following nine columns:

- Component Type
- Intended Function
- Material
- Environment
- Aging Effect
- Aging Management Program
- NUREG-2191 Item
- NUREG-2192 Table 1
- Notes

Component Type - The first column identifies all of the component types from Section 2 of the SLRA that are subject to AMR. They are listed in alphabetical order.

Intended Function - The second column contains the SLR intended functions for the listed component types. Definitions of intended functions are contained in Table 2.1.5-1.

Material - The third column lists the particular materials of construction for the component type.

Environment - The fourth column lists the environments to which the component types are exposed. Service environments and definitions are provided in Table 3.0-1. The definitions of those environments correspond to the definitions in NUREG-2191, Section IX.D. Note that an environment is listed with a temperature only if an aging effect is dependent on temperature. For example, the internal environment for a stainless steel component would be identified as “treated water > $60^{o}C$ ($>140^{o}F$)” when cracking due to stress corrosion cracking is identified, and as “treated water” when loss of material due to pitting and crevice corrosion is identified. Therefore, in this example, the component would be assigned two separate internal environments.

Aging Effect Requiring Management - As part of the AMR process, the aging effects that are required to be managed in order to maintain the intended function of the component type are identified for the material and environment combination. These aging effects requiring management are listed in the fifth column.

Aging Management Programs - The AMPs used to manage the aging effects requiring management are listed in the sixth column. AMPs are described in Appendix B.

NUREG-2191 Item - Each combination of component type, material, environment, aging effect requiring management, and AMP that is listed in Table 2, is compared to NUREG-2191, with consideration given to the standard notes, to identify consistency. Consistency is documented by noting the appropriate NUREG-2191 item number in the seventh column of Table 2. If there is no corresponding item number in NUREG-2191, this field in column seven is marked “None.” Thus, a reviewer can readily identify the correlation between the plant-specific tables and the NUREG-2191 tables.

Table 1 Item - Each combination of component, material, environment, aging effect requiring management, and aging management program that has an identified NUREG-2191 item number must also have a Table 3.x.1 line item reference number. The corresponding line item from Table 1 is listed in the eighth column of Table 2. If there is no corresponding item in NUREG-2191, this field in column eight is marked “None.” The Table 1 Item allows correlation of the information from the two tables.

Notes - The notes provided in each Table 2 describe how the information in the table aligns with the information in NUREG-2191. Each Table 2 contains standard industry lettered notes and, if applicable, plant-specific numbered notes.

The standard industry lettered notes (e.g., A, B, C) provide standard information regarding comparison of the AMR results with the NUREG-2191 Aging Management Table line item identified in the seventh column. In addition to the standard industry lettered notes, numbered plant-specific notes provide additional clarifying information when appropriate.

Table Usage

Table 1

The reviewer evaluates each row in Table 1 by moving from left to right across the table. Since the Component, Aging Effect, Aging Management Programs and Further Evaluation Recommended information is taken directly from NUREG-2192, no further analysis of those columns is required. The information intended to help the reviewer in this table is contained within the Discussion column. Here the reviewer will be given plant-specific information necessary to determine, in summary, how the evaluations and programs align with NUREG-2191. This may be in the form of descriptive information within the Discussion column or the reviewer may be referred to other locations within the SLRA for further information. A statement of “Consistent with NUREG-2191” means that the Table 2 items that link to that Table 1 row are consistent with the component, material, environment, aging effect, and program(s) associated with the assigned NUREG-2191 row, followed by any clarifications or exceptions that may apply.

Table 2

Table 2 contains all of the AMR information for the plant, whether or not it aligns with NUREG-2191. For a given row within the table, the reviewer is able to see the intended function, material, environment, aging effect requiring management and AMP combination for a particular component type within a system. Within each system or structure, the intended functions for each component type are consolidated for table listing. In addition, if there is a correlation between the combination in Table 2 and a combination in NUREG-2191, this will be identified by a referenced item number in column seven, NUREG-2191 Item. The reviewer can refer to the item number in NUREG-2191, if desired, to verify the correlation. If the column contains “None,” no corresponding combination in NUREG-2191 was found. As the reviewer continues across the table from left to right, within a given row, the next column is labeled NUREG-2192 Table 1 Item. If there is a reference number in this column, the reviewer is able to use that reference number to locate the corresponding row in Table 1 and see how the AMP for this particular combination aligns with NUREG-2191. Table 2 provides the reviewer with a means to navigate from the components subject to AMR in SLRA Section 2 all the way through the evaluation of the programs that will be used to manage the effects of aging of those components.

Cumulative Fatigue Damage and Time Limited Aging Analysis in Table 2

A fatigue analysis is considered to be a TLAA as defined in 10 CFR 54.3 when it is within the current licensing basis and is based upon transient cycle assumptions associated with the current operating term. This includes explicit ASME Code, Section III, Class 1 and ANSI B31.7 analyses for piping and components and implicit ASME Code, Section III, Class 2 and 3 and ANSI B31.1 analyses for piping. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). Table 1 and Table 2 include an entry in the AMP column indicating “TLAA” for each line item that has a component for which a fatigue TLAA (explicit or implicit) has been identified. See SLRA Section 4.3 for details regarding the fatigue design bases, fatigue TLAAs identified, and TLAA evaluations for the SPEO.

Table 3.0-1 Oconee Nuclear Station Service Environments

ONS AMR Environment	Definition	NUREG-2191 Environment(s) Used for AMR Comparison
Adverse localized environment Adverse localized environment caused by significant moisture	An adverse localized environment is an environment limited to the immediate vicinity of a component that is hostile to the component material, thereby leading to potential aging effects. Electrical insulation used for electrical cables can be subjected to an adverse localized environment. Adverse localized environment can be due to any of the following: (1) exposure to significant moisture, or (2) heat, radiation, or moisture and are represented by specific GALL-SLR AMR items.	Adverse localized environment
Air	Any indoor or outdoor air environment where the cited aging effects could occur regardless of the particular air environment (e.g., air-indoor uncontrolled, air-outdoor). For example: (a) hardening or loss of strength of elastomeric components occurs in many different air environments depending upon environmental parameters such as temperature, ozone, ultraviolet light, and radiation; (b) loss of preload for closure bolting can occur in a variety of air environments. This term does not encompass the air environment downstream of instrument air dryers, air-dry, or the underground environment. The potential for leakage from bolted connections (e.g., flanges, packing) impacting in-scope components exists when citing the air environment.	Air

Table 3.0-1 Oconee Nuclear Station Service Environments

ONS AMR Environment	Definition	NUREG-2191 Environment(s) Used for AMR Comparison
Air - dry	Air that has been treated to reduce its dew point well below the system operating temperature and treated to control lubricant content, particulate matter, and other corrosive contaminants. Use of this term is only associated with internal air environments located downstream of the compressed air system air dryers.	Air - dry
Air - indoor controlled	An environment where the specified internal or external surface of the component or structure is exposed to a humidity-controlled (i.e., air conditioned) environment. For electrical components and structures, the controlled environment must be sufficient to show that the electrical component(s) or structure(s) are not subjected to the cited aging effect(s) (e.g., reduced insulation resistance). The potential for leakage from bolted connections (e.g., flanges, packing) impacting in-scope components exists when citing the air–indoor controlled environment.	Air - indoor controlled
Air – indoor uncontrolled	Air–indoor uncontrolled is associated with systems with temperatures higher than the dew point (i.e., condensation can occur, but only rarely; equipment surfaces are normally dry). The potential for leakage from bolted connections (e.g., flanges, packing) impacting in-scope components exists when citing the air–indoor uncontrolled environment.	Air Air – indoor uncontrolled
Air - outdoor	The outdoor environment consists of moist air, industrial pollutants (e.g., fly ash, soot), ambient temperatures and humidity, and exposure to weather events, including precipitation and wind. The outdoor air environment also potentially includes component contamination due to animal infestation including by-products or excrement containing uric acid, ammonia, phosphates, or other compounds. The outdoor air environment can also result in submergence of components (particularly when they are in vaults) due to the potential for water to accumulate or due to external or internal buildup of condensation.	Air Air - outdoor

Table 3.0-1 Oconee Nuclear Station Service Environments

ONS AMR Environment	Definition	NUREG-2191 Environment(s) Used for AMR Comparison
Air with borated water leakage	Air and untreated borated water leakage on indoor or outdoor systems with temperatures either above or below the dew point. The water from leakage is considered to be untreated, due to the potential for water contamination at the surface (germane to PWRs).	Air with borated water leakage
Closed-cycle cooling water Closed-cycle cooling water >60 °C (>140 °F)	A subset of treated water that is subject to the closed treated water systems program. Systems are closed in that the rate of recirculation is much higher than the rate of makeup water addition. Examples include the closed portions of HVAC systems and diesel generator cooling water systems. Closed-cycle cooling water above 60 °C (140 °F) exceeds the threshold for stainless steel SCC.	Closed - cycle cooling water Closed-cycle cooling water >60 °C (>140 °F)
Concrete	This environment consists of components that sit on concrete or are embedded in concrete.	Concrete
Condensation	Condensation on the surfaces of systems at temperatures below the dew point facilitates loss of material in steel caused by general, pitting, and crevice corrosion. It also facilitates cracking in those materials susceptible to stress corrosion cracking due to the potential for internal or external surface contamination. The former term “moist air” is subsumed by the usage of the term “condensation.” Moisture in the air can result in loss of material or cracking due to hygroscopic surface contaminants. Condensation can form between thermal insulation and a component when air intrusion occurs through minor gaps in the insulation and the operating temperature of the component is below the dew point of the penetrating air.	Condensation
Diesel exhaust	This environment consists of gases, fluids, and particulates present in diesel engine exhaust. This environment is also used for the auxiliary steam boiler fuel oil combustion chambers.	Diesel exhaust

Table 3.0-1 Oconee Nuclear Station Service Environments

ONS AMR Environment	Definition	NUREG-2191 Environment(s) Used for AMR Comparison
Fuel Oil	Diesel oil, No. 2 oil, or other liquid hydrocarbons used to fuel diesel engines. Fuel oil used for combustion engines may be contaminated with water, which may promote additional aging effects.	Fuel oil
Gas	Internal gas environments include inert or nonreactive gases. This generic term is used where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the subsequent period of extended operation. The term “gas” is not meant to comprehensively include all gases in the fire suppression system. The GALL-SLR Report AMP XI.M26, “Fire Protection,” is used for the periodic inspection and testing of the halon/carbon dioxide fire suppression system.	Gas
Groundwater/soil	Groundwater is subsurface water that can be detected in wells, tunnels, or drainage galleries, or that flows naturally to the earth’s surface via seeps or springs. Soil is a mixture of organic and inorganic materials produced by the weathering of rock and clay minerals or the decomposition of vegetation. Voids containing air and moisture can occupy 30–60% of the soil volume. Concrete subjected to a groundwater/soil environment can be vulnerable to an increase in porosity and permeability, cracking, loss of material (spalling, scaling), or aggressive chemical attack. Other materials with prolonged exposures to groundwater or moist soils are subject to the same aging effects as those systems and components exposed to raw water.	Groundwater/soil

Table 3.0-1 Oconee Nuclear Station Service Environments

ONS AMR Environment	Definition	NUREG-2191 Environment(s) Used for AMR Comparison
Lubricating oil Lubricating oil (waste oil)	Lubricating oils are low-to-medium viscosity hydrocarbons that can contain contaminants and/or moisture. This usage also functionally encompasses hydraulic oil (nonwater based). These oils are used for bearing, gear, and engine lubrication. Piping and piping components, whether copper, SS, or steel, when exposed to lubricating oil with some water, will have limited susceptibility to aging degradation due to general or localized corrosion. Lubricating oil (waste oil) and lubricating oil are two different environments. Lubricating oil (waste oil) is oil that has been collected as it leaks from a component (e.g., reactor coolant pumps) and as such, contains potential contaminants such as water and dirt. Lubricating oil is unlikely to contain contaminants due to the testing of the oil and corrective actions when contaminants are detected.	Lubricating oil Lubricating oil (waste oil)
Raw water	Raw water is water that has not been demineralized or treated to any significant extent. Raw water may be rough filtered to remove large particles and may contain a biocide additive for control of micro- and macro-organisms. Lake Keowee provides the source of raw water utilized at Oconee.	Raw water
Raw water (potable) Raw water >60 °C (>140 °F) (potable)	Raw water (potable) is water which has been demineralized, filtered, or otherwise treated but is not maintained by a site chemistry control program. Raw water above 60 °C (140 °F) (potable) exceeds the threshold for stainless steel SCC.	Raw water (potable)

Table 3.0-1 Oconee Nuclear Station Service Environments

ONS AMR Environment	Definition	NUREG-2191 Environment(s) Used for AMR Comparison
Reactor coolant	Reactor coolant is treated water in the reactor coolant system and connected systems at or near full operating temperature.	Reactor coolant Reactor coolant and high fluence (>1E21 n/cm^2 E>0.1 MeV), Reactor coolant and secondary feedwater/steam, System temperature up to 340^{o}C (644^{o}F)
Reactor coolant > 250 ^{o}C (>482^{o}F)	Treated water above the thermal embrittlement threshold for cast austenitic stainless steel.	Reactor coolant > 250 ^{o}C (>482^{o}F)
Reactor coolant and neutron flux	The reactor core environment that will result in a neutron fluence exceeding 10^{17} n/cm^2 (E >1 MeV) at the end of the license renewal term.	Reactor coolant and neutron flux
Secondary feedwater	PWR feedwater at or near full operating temperature, subject to the secondary water chemistry program (GALL-SLR Report AMP XI.M2). This environment is used for steam generator components only.	Secondary feedwater Secondary feedwater/steam
Soil	Soil is a mixture of inorganic materials produced by the weathering of rock and clay minerals, and organic material produced by the decomposition of vegetation. Voids containing air and moisture occupy 30–60% of the soil volume. Properties of soil that can affect degradation kinetics include moisture content, pH, ion exchange capacity, density, and hydraulic conductivity. External environments included in the soil category consist of components at the air/soil interface, buried in the soil, or exposed to groundwater in the soil.	Buried Soil
Steam	PWR steam subject to the secondary water chemistry program (GALL-SLR Report AMP XI.M2). This environment is used for steam generator components only.	Secondary feedwater/steam Steam

Table 3.0-1 Oconee Nuclear Station Service Environments

ONS AMR Environment	Definition	NUREG-2191 Environment(s) Used for AMR Comparison
Treated borated water	Borated (PWR) water is a controlled water system. The high pressure injection system maintains the proper water chemistry in the reactor coolant system while adjusting the boron concentration during operation to match long-term reactivity changes in the core.	Treated borated water
Treated borated water >60°C (>140°F)	Treated water with boric acid in PWR systems above the 60 ^{o}C (140^{o}F) stress corrosion cracking threshold for stainless steel.	Treated borated water > 60 ^{o}C (>140^{o}F)
Treated borated water >250°C (>482°F)	Treated water with boric acid above the 250 °C (482 °F) thermal embrittlement threshold for cast austenitic stainless steel.	Treated borated water > 250 ^{o}C (>482^{o}F)
Treated water	Treated water is water whose chemistry has been altered and is maintained (as evidenced by testing) in a state which differs from naturally occurring sources so as to meet a desired set of chemical specifications. Treated water generally falls into one of two categories. 1) The first category is based on demineralized water and, with the possible exception of boric acid (for PWRs only), generally contains minimal amounts of any additions. The water is generally characterized by high purity, low conductivity, and very low oxygen content. This category of treated water is generally used as PWR primary and secondary water. 2) The second category may be but need not be based on demineralized water. It contains corrosion inhibitors and also may contain biocides or other additives. This water will generally be comparatively higher in conductivity and oxygen content than the first category of treated water. This category of treated water is generally used in HVAC systems, auxiliary boilers, and diesel engine cooling systems. Closed-cycle cooling water is a subset of this category of treated water.	Treated water

Table 3.0-1 Oconee Nuclear Station Service Environments

ONS AMR Environment	Definition	NUREG-2191 Environment(s) Used for AMR Comparison
Treated water > 60 °C (>140°F)	Treated water above the 60 °C (140°F) stress corrosion cracking threshold for stainless steel.	Treated water > 60 °C (>140°F)
Underground	Underground piping and tanks are below grade, but are contained within a tunnel or vault such that they are in contact with air and are located where access for inspection is limited (e.g., special lifting equipment is required to gain access to the vault). When the underground environment is cited, the term includes exposure to air-outdoor, air-indoor uncontrolled, air, raw water, groundwater, and condensation.	Underground
Waste water Waste water >60°C (>140°F)	Radioactive, potentially radioactive or nonradioactive waters that are collected from equipment and floor drains. Waste waters may contain contaminants, including oil and boric acid, depending on location, as well as originally treated water that is not monitored by a chemistry program. Waste water above 60°C (140°F) exceeds the threshold for stainless steel stress corrosion cracking.	Waste water Waste water >60°C (>140°F)
Water-flowing	Water that is refreshed; thus, it has a greater impact on leaching and can include rainwater, raw water, groundwater, or water flowing under a foundation.	Water-flowing
Water-standing	Water that is stagnant and unrefreshed, thus possibly resulting in increased ionic strength up to saturation.	Water-standing

3.1 AGING MANAGEMENT OF REACTOR VESSEL, REACTOR INTERNALS, AND REACTOR COOLANT SYSTEM

3.1.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.1, Reactor Vessel, Reactor Internals, and Reactor Coolant System, as being subject to aging management review. The system, or portions of systems, which are addressed in this section are described in the indicated sections.

- Reactor Vessel (Section 2.3.1.1)
- Reactor Vessel Internals (Section 2.3.1.2)
- Reactor Coolant System (Section 2.3.1.3)
- Steam Generators (Section 2.3.1.4)

3.1.2 RESULTS

The following tables summarize the results of the aging management review for the Reactor Vessel, Reactor Internals, and Reactor Coolant System.

- Table 3.1.2-1, Reactor Vessel, Reactor Internals, and Reactor Coolant System – Reactor Vessel - Aging Management Evaluation
- Table 3.1.2-2, Reactor Vessel, Reactor Internals, and Reactor Coolant System – Reactor Vessel Internals - Aging Management Evaluation
- Table 3.1.2-3, Reactor Vessel, Reactor Internals, and Reactor Coolant System – Reactor Coolant System - Aging Management Evaluation
- Table 3.1.2-4, Reactor Vessel, Reactor Internals, and Reactor Coolant System – Steam Generators - Aging Management Evaluation

3.1.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.1.2.1.1 Reactor Vessel

Materials

Components in the Reactor Vessel are constructed of the following materials:

* High-Strength Steel
* Nickel Alloy
* Stainless Steel
* Steel
* Steel (with Stainless Steel Cladding)
* Steel with Nickel Alloy Cladding

Environments

Components in the Reactor Vessel are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Reactor Coolant
* Reactor Coolant and Neutron Flux

Aging Effects Requiring Management

Components in the Reactor Vessel require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Loss of Fracture Toughness
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Reactor Vessel are managed by the following AMPs:

* ASME Code Class 1 Small-Bore Piping (B2.1.22)
* ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)
* Neutron Fluence Monitoring (B3.2)
* One-Time Inspection (B2.1.20)
* Reactor Head Closure Stud Bolting (B2.1.3)
* Reactor Vessel Material Surveillance (B2.1.19)
* TLAA
* Water Chemistry (B2.1.2)

3.1.2.1.2 Reactor Vessel Internals

Materials

Components in the Reactor Vessel Internals are constructed of the following materials:

* Cast Austenitic Stainless Steel
* Nickel Alloy
* Stainless Steel

Environments

Components in the Reactor Vessel Internals are exposed to the following environments:

* Reactor Coolant and Neutron Flux

Aging Effects Requiring Management

Components in the Reactor Vessel Internals require aging management to address the following aging effects:

* Change in Dimension
* Cracking
* Cumulative Fatigue Damage
* Loss of Fracture Toughness
* Loss of Material
* Loss of Preload
* Reduction in Fracture Toughness

Aging Management Programs

The aging effects for components in the Reactor Vessel Internals are managed by the following AMPs:

* PWR Vessel Internals (B2.1.7)
* TLAA

* Water Chemistry (B2.1.2)

3.1.2.1.3 Reactor Coolant System

Materials

Components in the Reactor Coolant System are constructed of the following materials:

* Cast Austenitic Stainless Steel
* Copper Alloy
* Fiberglass
* Nickel Alloy
* Stainless Steel
* Steel
* Steel (with Stainless Steel Cladding)

Environments

Components in the Reactor Coolant System are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Lubricating Oil
* Lubricating Oil (Waste Oil)
* Reactor Coolant
* Reactor Coolant >250°C (>482°F)
* Treated Borated Water
* Treated Borated water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Reactor Coolant System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage

* Loss of Fracture Toughness
* Loss of Material
* Loss of Preload
* Reduced Thermal Insulation Resistance

Aging Management Programs

The aging effects for components in the Reactor Coolant System are managed by the following AMPs:

* ASME Code Class 1 Small-Bore Piping (B2.1.22)
* ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Lubricating Oil Analysis (B2.1.25)
* One-Time Inspection (B2.1.20)
* Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) (B2.1.6)
* TLAA
* Water Chemistry (B2.1.2)

3.1.2.1.4 Steam Generators

Materials

Components in the Steam Generators are constructed of the following materials:

* Nickel Alloy
* Stainless Steel
* Steel
* Steel (with Stainless Steel Cladding)
* Steel with Nickel Alloy Cladding

Environments

Components in the Steam Generators are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Reactor Coolant
* Secondary Feedwater
* Steam
* Treated Water

Aging Effects Requiring Management

Components in the Steam Generators require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer
* Wall Thinning

Aging Management Programs

The aging effects for components in the Steam Generators are managed by the following AMPs:

* ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* One-Time Inspection (B2.1.20)
* Steam Generators (B2.1.10)
* TLAA
* Water Chemistry (B2.1.2)

3.1.2.2 Further Evaluation of Aging Management as Recommended by NUREG-2192

NUREG-2192 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the SLRA. For the reactor vessel, reactor internals, and reactor coolant system, those evaluations are addressed in the following sections. Italicized text is taken directly from NUREG-2192.

3.1.2.2.1 Cumulative Fatigue Damage

NUREG-2192:

Evaluations involving time-dependent fatigue or cyclical loading parameters may be time-limited aging analyses (TLAAs), as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). These types of TLAAs are addressed separately in Section 4.3, "Metal Fatigue," of this SRP-SLR. For plant-specific cumulative usage factor calculations that are based on stress-based input methods, the methods are to be appropriately defined and discussed in the applicable TLAAs.

Evaluation:

[3.1.1-001] - The evaluation of fatigue is a TLAA for the steel reactor vessel closure flange assembly components exposed to air-indoor uncontrolled in the reactor vessel, reactor vessel internals, and reactor coolant system, and is addressed in Section 4.3, "Metal Fatigue".

[3.1.1-002] – The evaluation of fatigue is a TLAA for nickel alloy steam generator components exposed to reactor coolant or secondary feedwater/steam in the reactor vessel, internals, and reactor coolant system, and is addressed in Section 4.3, "Metal Fatigue".

[3.1.1-003] – The evaluation of fatigue is a TLAA for stainless steel and nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux in the reactor vessel, internals, and reactor coolant system, and is addressed in Section 4.3, "Metal Fatigue".

[3.1.1-004] – The evaluation of fatigue is a TLAA for steel reactor vessel support skirt components in the reactor vessel, internals, and reactor coolant system, and is addressed in Section 4.3, "Metal Fatigue".

[3.1.1-005] – The evaluation of fatigue is a TLAA for steel, stainless steel, steel (with stainless steel or nickel alloy cladding) steam generator components, pressurizer relief tank components, piping components, and bolting in the reactor vessel, internals, and reactor coolant system, and is discussed in Section 4.3, "Metal Fatigue".

[3.1.1-006] – Not applicable - BWR only

[3.1.1-007] – Not applicable - BWR only.

[3.1.1-008] – The evaluation of fatigue is a TLAA for stainless steel, steel (with or without nickel alloy or stainless steel cladding) or nickel alloy steam generator components exposed to reactor coolant in the reactor vessel, internals, and reactor coolant system, and is addressed in Section 4.3, “Metal Fatigue”.

[3.1.1-009] – The evaluation of fatigue is a TLAA for stainless steel, steel (with or without nickel alloy or stainless steel cladding), and nickel alloy reactor coolant pressure boundary piping, piping components, and other pressure retaining components exposed to reactor coolant exposed to reactor coolant in the reactor vessel, internals, and reactor coolant system, and is addressed in Section 4.3, “Metal Fatigue”, and in Section 4.7.4, “Leak-Before-Break”.

[3.1.1-010] – The evaluation of fatigue is a TLAA for steel (with or without nickel alloy or stainless steel cladding), stainless steel, or nickel alloy reactor vessel components, nozzles, penetrations, pressure housings, safe ends, thermal sleeves, vessel shells, heads and welds exposed to reactor coolant in the reactor vessel, internals, and reactor coolant system, and is addressed in Section 4.3, “Metal Fatigue”.

[3.1.1-011] – The evaluation of fatigue is a TLAA for steel or stainless steel pump and valve closure bolting exposed to high temperatures and thermal cycles in the reactor vessel, internals, and reactor coolant system, and is addressed in Section 4.3, “Metal Fatigue”.

3.1.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

NUREG-2192:

1. *Loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR SG upper and lower shell and transition cone exposed to secondary feedwater and steam. The existing program relies on control of water chemistry to mitigate corrosion and inservice inspection (ISI) to detect loss of material. The extent and schedule of the existing SG inspections are designed to ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds. However, according to NRC Information Notice (IN) 90-04, “Cracking of the Upper Shell-to-Transition Cone Girth Welds in Steam Generators,” the program may not be sufficient to detect pitting and crevice corrosion if general and pitting corrosion of the shell is known to exist. Augmented inspection is recommended to manage this aging effect. Furthermore, this issue is limited to Westinghouse Model 44 and 51 Steam Generators, where a high-stress region exists at the shell to transition cone weld. Acceptance criteria are described in Branch Technical Position (BTP) RLSB-1 (Appendix A.1 of this SRP-SLR).*

2. *Loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR steam generator shell assembly exposed to secondary feedwater and steam. The existing program relies on control of secondary water chemistry to mitigate corrosion. However, some applicants have replaced only the bottom part of their recirculating SGs, generating a cut in the middle of the transition cone, and, consequently, a new transition cone closure weld. It is recommended that volumetric examinations be performed in*

accordance with the requirements of ASME Code Section XI for upper shell and lower shell-to-transition cones with gross structural discontinuities for managing loss of material due to general, pitting, and crevice corrosion in the welds for Westinghouse Model 44 and 51 SGs, where a high-stress region exists at the shell-to-transition cone weld.

The new continuous circumferential weld, resulting from cutting the transition cone as discussed above, is a different situation from the SG transition cone welds containing geometric discontinuities. Control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. The new transition area weld is a field weld as opposed to having been made in a controlled manufacturing facility, and the surface conditions of the transition weld may result in flow conditions more conducive to initiation of general, pitting, and crevice corrosion than those of the upper and lower transition cone welds. Crediting of the ISI program for the new SG transition cone weld may not be an effective basis for managing loss of material in this weld, as the ISI criteria would only perform a VT-2 visual leakage examination of the weld as part of the system leakage test performed pursuant to ASME Code Section XI requirements. In addition, ASME Code Section XI does not require licensees to remove insulation when performing visual examination on nonborated treated water systems. Therefore, the effectiveness of the chemistry control program should be verified to ensure that loss of material due to general, pitting and crevice corrosion is not occurring.

For the new continuous circumferential weld, further evaluation is recommended to verify the effectiveness of the chemistry control program. A one-time inspection at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly, such that the component's intended function will be maintained during the subsequent period of extended operation. Furthermore, this issue is limited to replacement of recirculating SGs with a new transition cone closure weld.

<u>Evaluation</u>

[3.1.1-012] – Not applicable to ONS B&W steam generators. This further evaluation item applies to Westinghouse steam generators.

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

<u>NUREG-2192:</u>

1. *Neutron irradiation embrittlement is a TLAA to be evaluated for the subsequent period of extended operation for all ferritic materials that have a neutron fluence greater than 10^{17} n/cm^2 (E>1 MeV) at the end of the subsequent period of extended operation. Certain aspects of neutron irradiation embrittlement are TLAAs as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). This TLAA is*

addressed separately in Section 4.2, "Reactor Pressure Vessel Neutron Embrittlement Analysis," of this SRP-SLR.

2. *Loss of fracture toughness due to neutron irradiation embrittlement could occur in BWR and PWR reactor vessel beltline shell nozzle, and welds exposed to reactor coolant and neutron flux. A reactor vessel material surveillance program monitors neutron irradiation embrittlement of the reactor vessel. The reactor vessel material surveillance program is either a plant-specific surveillance program or an integrated surveillance program, depending on matters such as the composition of limiting materials and the availability of surveillance capsules.*

   In accordance with 10 CFR Part 50, Appendix H, an applicant is required to submit its proposed withdrawal schedule for approval prior to implementation. Untested capsules placed in storage must be maintained for future insertion. Thus, further NRC staff evaluation is required for a subsequent license renewal (SLR). Specific recommendations for an acceptable AMP are provided in GALL-SLR Report AMP XI.M31, "Reactor Vessel Material Surveillance."

   A neutron fluence monitoring program may be used to monitor the neutron fluence levels that are used as the time-dependent inputs for the plant's reactor vessel neutron irradiation embrittlement TLAAs. These TLAAs are the subjects of the topics discussed in SRP-SLR Section 3.1.2.2.3.1 and "acceptance criteria" and "review procedure" guidance in SRP-SLR Section 4.2. For those applicants that determine it is appropriate to include a neutron fluence monitoring AMP in their SLRAs, the program is to be implemented in conjunction with the applicant's implementation of an AMP that corresponds to GALL-SLR Report AMP X1.M31, "Reactor Vessel Material Surveillance." Specific recommendations for an acceptable neutron fluence monitoring AMP are provided in GALL-SLR Report AMP X.M2, "Neutron Fluence Monitoring."

3 *Reduction in Fracture Toughness is a plant-specific TLAA for B&W reactor internals to be evaluated for the subsequent period of extended operation in accordance with the NRC staff's safety evaluation concerning "Demonstration of the Management of Aging Effects for the Reactor Vessel Internals," B&W Owners Group report number BAW-2248, which is included in BAW-2248A, March 2000. Plant-specific TLAAs are addressed in Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses," of this SRP-SLR.*

<u>Evaluation</u>

[3.1.1-013] – Neutron irradiation embrittlement is a TLAA as defined in 10 CFR 54.3 and is evaluated in Section 4.2, "Reactor Vessel Neutron Embrittlement Analysis".

[3.1.1-014] – Loss of fracture toughness due to neutron irradiation embrittlement could occur in the reactor vessel beltline, shell, nozzle, and welds. The *Reactor Vessel Material Surveillance* program (B2.1.19) and the *Neutron Fluence Monitoring* program (B3.2) monitors neutron irradiation embrittlement of the reactor vessel.

[3.1.1-015] – *Reduction in Fracture Toughness* is a TLAA as defined in 10 CFR 54.3 and is evaluated in Section 4.2, “Reactor Vessel Neutron Embrittlement Analysis”.

3.1.2.2.4 Cracking Due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

NUREG-2192:

1 *Cracking due to stress corrosion cracking (SCC) and intergranular stress corrosion cracking (IGSCC) could occur in stainless steel (SS) and nickel alloy reactor vessel (RV) flange leak detection lines of BWR light-water reactor facilities. The plant-specific operating experience (OE) and condition of the RV flange leak detection lines are evaluated to determine if SCC or IGSCC has occurred. The aging effect of cracking in SS and nickel alloy RV flange leak detection lines is not applicable and does not require management if (a) the plant-specific OE does not reveal a history of SCC or IGSCC and (b) a one-time inspection demonstrates that the aging effect is not occurring. The applicant documents the results of the plant-specific OE review in the SLRA. GALL-SLR Report AMP X1.M32, “One-Time Inspection,” describes an acceptable program to demonstrate that cracking is not occurring. If cracking has occurred, GALL-SLR Report AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” describes an acceptable program to manage cracking in the RV flange leak detection lines.*

2. *Cracking due to SCC and IGSCC could occur in SS BWR isolation condenser components exposed to reactor coolant. The existing program relies on control of reactor water chemistry to mitigate SCC and on ASME Code Section XI ISI to detect cracking. However, the existing program should be augmented to detect cracking due to SCC and IGSCC. An augmented program is recommended to include temperature and radioactivity monitoring of the shell-side water and eddy current testing of tubes to ensure that the component’s intended function will be maintained during the subsequent period of extended operation. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

Evaluation

Not applicable - BWR only.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

NUREG-2192:

Crack growth due to cyclic loading could occur in reactor pressure vessel (RPV) shell forgings clad with SS using a high-heat-input welding process. Therefore, the current licensing basis (CLB) may include flaw growth evaluations of intergranular separations (i.e., underclad cracks) that have been identified in the RPV-to-cladding welds for the vessel. The evaluations apply to

SA-508 Class 2 RPV forging components where the cladding was deposited and welded to the vessel using a high-heat-input welding process. For CLBs that include these types of evaluations, the evaluations may need to be identified as TLAAs if they are determined to conform to the six criteria for defining TLAAs in 10 CFR 54.3(a). The methodology for evaluating the underclad flaw should be consistent with the flaw evaluation procedure and criterion in the ASME Code Section XI. See SRP-SLR, Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses," for generic guidance for meeting the requirements of 10 CFR 54.21(c).

Evaluation

[3.1.1-018] – Crack growth due to cyclic loading (underclad cracking) is a TLAA as defined in 10 CFR 54.3. The evaluation of crack growth due to cyclic loading as a TLAA for the reactor vessel is discussed in Section 4.7.2, "Reactor Vessel Underclad Cracking".

3.1.2.2.6 Cracking Due to Stress Corrosion Cracking

NUREG-2192:

1. *Cracking due to SCC could occur in PWR SS bottom-mounted instrument guide tubes exposed to reactor coolant. Further evaluation is recommended to ensure that these aging effects are adequately managed. A plant-specific AMP should be evaluated to ensure that this aging effect is adequately managed. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

2. *Cracking due to SCC could occur in Class 1 PWR cast austenitic stainless steel (CASS) reactor coolant system piping and piping components exposed to reactor coolant. The existing program relies on control of water chemistry to mitigate SCC; however, SCC could occur in CASS components that do not meet the NUREG-0313, "Technical Report on Material Selection and Process Guidelines for BWR Coolant Pressure Boundary Piping" guidelines with regard to ferrite and carbon content. Further evaluation is recommended of a plant-specific program for these components to ensure that this aging effect is adequately managed. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

3. *Cracking due to SCC could occur in SS or nickel alloy RV flange leak detection lines of PWR light-water reactor facilities. The plant-specific OE and condition of the RV flange leak detection lines are evaluated to determine if SCC has occurred. The aging effect of cracking in SS and nickel alloy RV flange leak detection lines is not applicable and does not require management if (a) the plant-specific OE does not reveal a history of SCC and (b) a one-time inspection demonstrates that the aging effect is not occurring. The applicant documents the results of the plant-specific OE review in the SLRA. GALL-SLR Report AMP XI.M32, "One-Time Inspection," describes an acceptable program to demonstrate that cracking is not occurring. If cracking has ocurred, GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," describes an acceptable program to manage cracking in RV flange leak detection lines.*

Evaluation

[3.1.1-019] – Not applicable. ONS Units 1, 2, and 3 utilize B&W reactors. The associated NUREG-2191 aging items are not used.

[3.1.1-020] – Cracking due to stress corrosion cracking could occur in Class 1 PWR cast austenitic stainless steel reactor coolant system piping and piping components exposed to reactor coolant. ONS applicable components are valve bodies and reactor coolant pump suction and discharge nozzles. Mitigation and monitoring of cracking of valve bodies and reactor coolant pump suction and discharge nozzles are managed by the *Water Chemistry* (B2.1.2) program and the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* (B2.1.1) program, respectively. The *Water Chemistry* (B2.1.2) program provides controls to minimize the presence of contaminants that promote stress corrosion cracking. The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* (B2.1.1) program provides for periodic testing and inspections to detect cracking.

[3.1.1-139] – Cracking due to stress corrosion cracking could occur in stainless steel or nickel alloy reactor vessel flange leak detection lines of PWR light-water reactor facilities. A review of ONS OE identified that a subset of these lines was susceptible to inner diameter initiated cracking in a localized vertical region of NSSS vendor supplied piping where contaminants could concentrate. Based on the results of metallurgical investigation, plant modifications were implemented between 2004 and 2008 on all three units to cut and cap the affected lines above the area of concern. This design change alleviated the potential for cracking associated with this OE. No evidence of cracking or leakage has been identified in the remaining segments of capped piping or in the unaffected reactor vessel leakage detection lines. The *One-Time Inspection* (B2.1.20) program will be used to verify that cracking is not occurring in the remaining reactor vessel leakage detection piping (including capped piping segments) or in comparable locations in the reactor coolant system aligned to this standard review plan item.

3.1.2.2.7 Cracking Due to Cyclic Loading

NUREG-2192:

Cracking due to cyclic loading could occur in steel and SS BWR isolation condenser components exposed to reactor coolant. The existing program relies on ASME Code Section XI ISI. However, the existing program should be augmented to detect cracking due to cyclic loading. An augmented program is recommended to include temperature and radioactivity monitoring of the shell-side water and eddy current testing of tubes to ensure that the component's intended function will be maintained during the subsequent period of extended operation. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

Evaluation

Not applicable - BWR only.

3.1.2.2.8 Loss of Material Due to Erosion

NUREG-2192:

Loss of material due to erosion could occur in steel steam generator feedwater impingement plates and supports exposed to secondary feedwater. Further evaluation is recommended of a plant-specific AMP to ensure that this aging effect is adequately managed. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

Evaluation

[3.1.1-022] - Not applicable to ONS once through steam generators. The ONS steam generators do not have feedwater impingement plates and associated supports.

3.1.2.2.9 Aging Management of Pressurized Water Reactor Vessel Internals (Applicable to Subsequent License Renewal Periods Only)

NUREG-2192:

Electric Power Research Institute (EPRI) Topical Report (TR)-1022863, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)" (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12017A191 through ML12017A197 and ML12017A199), provided the industry's initial set of aging management inspection and evaluation (I&E) recommendations for the reactor vessel internal (RVI) components that are included in the design of a PWR facility. Since the issuance of MRP-227-A on January 9, 2012, EPRI updated its I&E guidelines for the PWR RVI components in Topical Report No. 3002017168, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227, Revision 1-A)" (ADAMS Accession No. ML20175A112). MRP-227, Revision 1-A, incorporated the industry's bases for resolving operating experience and industry lessons learned resulting from component-specific inspections performed since the issuance of MRP-227-A in January 2012. The staff found the guidelines in MRP-227, Revision 1-A, acceptable, as documented in a staff-issued safety evaluation dated April 25, 2019 (ADAMS Accession No. ML19081A001) and approved the topical report for use as documented in the staff's letters to the EPRI Materials Reliability Program (MRP) dated February 19, 2020 and July 7, 2020 (ADAMS Accession Nos. ML20006D152 and ML20175A149).

In MRP-227, Revision 1-A, the EPRI MRP identified that the following aging mechanisms may be applicable to the design of the RVI components in these types of facilities: (a) stress corrosion cracking (SCC), (b) irradiation-assisted stress corrosion cracking (IASCC), (c) fatigue, (d) wear, (e) neutron irradiation embrittlement, (f) thermal aging embrittlement, (g) void swelling and irradiation growth or component distortion, and (h) thermal or irradiation-enhanced stress relaxation or irradiation enhanced creep.

The EPRI MRP's functionality analysis and failure modes, effects, and criticality analysis bases for grouping Westinghouse-designed, B&W-designed and Combustion Engineering (CE)-designed RVI components into the applicable inspection categories (as evaluated in MRP-227, Revision 1-A) were based on an assessment of aging effects and relevant time-dependent aging parameters through a cumulative 60-year licensing period (i.e., 40 years for the initial operating license period plus an additional 20 years during the initial period of extended operation). The EPRI MRP's assessment in MRP-227, Revision 1-A, did not evaluate whether operation of Westinghouse-designed, B&W-designed and CE-designed reactors during an SLR operating period (60 to 80 years) would have an impact on the existing susceptibility rankings and inspection categorizations for the RVI components in these designs, as defined in MRP-227, Revision 1-A or the applicable MRP background documents (e.g., MRP-191, Revision 1, for Westinghouse-designed or CE-designed RVI components or MRP-189, Revision 2, for B&W-designed components).

As described in GALL-SLR Report AMP XI.M16A, the applicant may use the MRP-227, Revision 1-A based AMP as an initial reference basis for developing and defining the AMP that will be applied to the RVI components for the subsequent period of extended operation. However, to use this alternative basis, GALL-SLR Report AMP XI.M16A recommends that the MRP-227, Revision 1-A based AMP be enhanced to include a gap analysis of the components that are within the scope of the AMP. The gap analysis is a basis for identifying and justifying changes to the MRP-227, Revision 1-A based program that are necessary to provide reasonable assurance that the effects of age-related degradation will be managed during the subsequent period of extended operation. The criteria for the gap analysis are described in GALL-SLR Report AMP XI.M16A. If a gap analysis is needed to establish the appropriate aging management criteria for the RVI components, the applicant has the option of including the gap analysis in the SLRA or making the gap analysis and any supporting gap analysis documents available in the in-office audit portal for the SLRA review.

Subsequent license renewal (SLR) applicants for units of a PWR design will no longer need to include separate SLRA Appendix C section responses in resolution of the A/LAIs previously issued on MRP-227-A because the A/LAIs were resolved and closed by the staff in the April 25, 2019, safety evaluation for MRP-227, Revision 1-A. The sole A/LAI issued by the staff in the safety evaluation dated April 25, 2019, relates to an applicant's methods and timing of inspections that will be applied to the baffle-to-former bolts or core shroud bolts in the plant design. Since an applicant's resolution of this A/LAI can be appropriately addressed in the "Operating Experience" program element discussion for the AMP and in the applicant's basis document for the AMP, a separate SLRA Appendix C response for the A/LAI is unnecessary.

Alternatively, the PWR SLRA may define a plant-specific AMP for the RVI components to demonstrate that the RVI components will be managed in accordance with the requirements of 10 CFR 54.21(a)(3) during the proposed subsequent period of extended operation. Components to be inspected, parameters monitored, monitoring methods, inspection sample size, frequencies, expansion criteria, and acceptance criteria are justified in the SLRA. If the AMP is a plant-specific program, the NRC staff will assess the adequacy of the plant-specific AMP against the criteria for the 10 AMP program elements that are defined in Section A.1.2.3 of SRP-SLR Appendix A.1.

Evaluation

[3.1.1-051a] [3.1.1-051b] [3.1.1-055a] [3.1.1-058a] [3.1.1-058b] [3.1.1-118] [3.1.1-119] – Electric Power Research Institute (EPRI) Topical Report (TR)-1022863, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)" provides the industry's aging management recommendations for the reactor vessel internal components that are included in the design of a PWR facility. The methodology in MRP-227-A was approved by the NRC in a safety evaluation dated December 16, 2011, which includes those plant specific applicant/licensee action items that a licensee or applicant applying the MRP-227-A report would need to address and resolve and apply to its licensing basis. MRP-227 Revision 1 has since been developed, and was approved by the NRC in a safety evaluation dated April 25, 2019 as MRP-227-1A.

ONS is in the process of transitioning its *PWR Vessel Internals* (B2.1.7) program from MRP-227-A to MRP-227-1A. The approved MRP-227-1A guidelines are based on an analysis of the reactor vessel internals that considers the operating conditions up to a 60 year operating period. To address an 80 year operating period, the guidelines have been supplemented with a gap analysis that identifies enhancements to the *PWR Vessel Internals* (B2.1.7) program. The MRP-227-1A gap analysis for PWR vessel internals aging management is incorporated into the *PWR Vessel Internals* program description in Appendix B of the LRA. This gap analysis provides a basis for identifying and justifying changes to the MRP-227-1A based program that are necessary to provide reasonable assurance that the effects of age related degradation will be managed during the SPEO.

The *PWR Vessel Internals* (B2.1.7) program manages the applicable aging effects for the reactor vessel internal components and the *Water Chemistry* (B2.1.2) program monitors and controls water environments consistent with industry guidelines to ensure that the reactor coolant water environment is favorable to mitigate SCC in reactor vessel internal components.

3.1.2.2.10 Loss of Material Due to Wear

NUREG-2192:

1. *Industry OE indicates that loss of material due to wear can occur in PWR control rod drive (CRD) head penetration nozzles made of nickel alloy due to the interactions between the nozzle and the thermal sleeve centering pads of the nozzle. The CRD head penetration nozzles are also called control rod drive mechanism (CRDM) nozzles or CRDM head adapter tubes. The applicant should perform a further evaluation to confirm the adequacy of a plant-specific AMP or analysis (with any necessary inspections) for management of the aging effect. The applicant may use the acceptance criteria, which are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR), to demonstrate the adequacy of a plant-specific AMP. Alternatively, the applicant may perform an analysis with any necessary inspections to confirm that loss of material due to wear does not affect the intended function(s) of these CRD head penetration nozzles, consistent with the current licensing basis (CLB).*

2. *Industry OE indicates that loss of material due to wear can occur in the SS thermal sleeves of PWR CRD head penetration nozzles due to the interactions between the nozzle and the thermal sleeve (e.g., where the thermal sleeve exits from the head penetration nozzle inside the reactor vessel). Therefore, the applicant should perform a further evaluation to confirm the adequacy of a plant-specific AMP for management of the aging effect. The applicant may use the acceptance criteria, which are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR), to demonstrate the adequacy of a plant-specific AMP.*

Evaluation

[3.1.1-116] [3.1.1-117] - Not applicable to ONS. B&W reactors have a different configuration that utilize a leadscrew support tube, leadscrew support nut, and leadscrew support nut lock washer.

3.1.2.2.11 Cracking Due to Primary Water Stress Corrosion Cracking

NUREG-2192:

1. *Foreign OE in steam generators with a design similar to that of Westinghouse steam generators (particularly Model 51) has identified cracks due to primary water stress corrosion cracking (PWSCC) in steam generator (SG) divider plate assemblies fabricated of Alloy 600 and/or the associated Alloy 600 weld materials, even with proper primary water chemistry. Cracks have been detected in the stub runner with depths typically about 0.08 inches (EPRI 3002002850).*

   All but one of these instances of cracking has been detected in divider plate assemblies that are approximately 1.3 inches in thickness. For the cracks in the 1.3-inch thick divider plate assemblies, the cracks tend to be parallel to the divider-plate-to-stub-runner weld (i.e., run horizontally in parallel to the lower surface of the tubesheet). For the one instance of cracking in a divider plate assembly with a thickness greater than 1.3 inches, the cracking occurred in a divider plate assembly with a thickness of approximately 2.4 inches near manufacturing marks on the upper end of the stub runner used for locating tubesheet holes. These flaws were estimated to be approximately 0.08-inch deep.

   Although these instances indicate that the water chemistry program may not be sufficient to manage cracking due to PWSCC in SG divider plate assemblies, analyses by the industry indicate that PWSCC in the divider plate assembly does not pose a structural integrity concern for other steam generator components (e.g., tubesheet and tube-to tubesheet welds) and does not adversely affect other safety analyses (e.g., analyses supporting tube plugging and repairs, tube repair criteria, and design basis accidents). In addition, the industry analyses indicate that flaws in the divider plate assembly will not adversely affect the heat transfer function (as a result of bypass flow) during normal forced flow operation, during natural circulation conditions (assessed in the analyses of various design basis accidents), or in the event of a loss-of-coolant accident (LOCA).

Furthermore, additional industry analyses indicate that PWSCC in the divider plate assembly is unlikely to adversely impact adjacent items, such as the tubesheet cladding, tube-to-tubesheet welds, and channel head. Therefore,

- *For units with divider plate assemblies fabricated of Alloy 690 and Alloy 690 type weld materials, a plant-specific AMP is not necessary.*
- *For units with divider plate assemblies fabricated of Alloy 600 or Alloy 600 type weld materials, if the analyses performed by the industry (EPRI 3002002850) are applicable and bounding for the unit, a plant-specific AMP is not necessary.*
- *For units with divider plate assemblies fabricated of Alloy 600 or Alloy 600 type weld materials, if the industry analyses (EPRI 3002002850) are not bounding for the applicant's unit, a plant-specific AMP is necessary or a rationale is necessary for why such a program is not needed. A plant-specific AMP (one beyond the primary water chemistry and the steam generator programs) may include a one-time inspection that is capable of detecting cracking to verify the effectiveness of the water chemistry and steam generator programs and the absence of PWSCC in the divider plate assemblies.*

The existing programs rely on control of reactor water chemistry to mitigate cracking due to PWSCC and general visual inspections of the channel head interior surfaces (included as part of the steam generator program). The GALL-SLR Report recommends further evaluation for a plant-specific AMP to confirm the effectiveness of the primary water chemistry and steam generator programs as described in this section. Acceptance criteria for a plant-specific AMP are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR). In place of a plant-specific AMP, the applicant may provide a rationale to justify why a plant-specific AMP is not necessary.

2. *Cracking due to PWSCC could occur in SG nickel alloy tube-to-tubesheet welds exposed to reactor coolant. The acceptance criteria for this review are:*

- *For units with Alloy 600 SG tubes for which an alternate repair criterion such as C*, F*, H*, or W* has been permanently approved for both the hot- and cold-leg side of the steam generator, the weld is no longer part of the reactor coolant pressure boundary and a plant-specific AMP is not necessary;*
- *For units with Alloy 600 steam generator tubes, if there is no permanently approved alternate repair criteria such as C*, F*, H*, or W*, or permanent approval applies to only either the hot- or cold-leg side of the steam generator, a plant-specific AMP is necessary;*
- *For units with thermally treated Alloy 690 SG tubes and with tubesheet cladding using Alloy 690 type material, a plant-specific AMP is not necessary;*
- *For units with thermally treated Alloy 690 SG tubes and with tubesheet cladding using Alloy 600 type material, a plant-specific AMP is necessary unless the applicant confirms that the industry's analyses for tube-to-tubesheet weld cracking (e.g., chromium content for the tube-to-tubesheet welds is approximately 22 percent and the tubesheet primary face is in compression as discussed in EPRI 3002002850) are applicable and bounding for the unit, and the applicant will perform general visual inspections of the tubesheet region looking for evidence of cracking (e.g., rust stains*

on the tubesheet cladding) as part of the steam generator program. In lieu of a plant-specific AMP, the applicant may provide a rationale for why a plant-specific AMP is not necessary.

The existing programs rely on control of reactor water chemistry to mitigate cracking due to PWSCC and visual inspections of the steam generator head interior surfaces. Along with the primary water chemistry and steam generator programs, a plant-specific AMP should be evaluated to confirm the effectiveness of the primary water chemistry and steam generator programs in certain circumstances. A plant-specific AMP may include a one-time inspection that is capable of detecting cracking to confirm the absence of PWSCC in the tube-to-tubesheet welds. Acceptance criteria for a plant-specific AMP are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR). In place of a plant-specific AMP, the applicant may provide a rationale to justify why a plant-specific AMP is not necessary.

Evaluation

[3.1.1-025] – Cracking of divider plates is not applicable to the ONS once through steam generators.

Oconee Unit 1, 2 and 3 replacement once through steam generators do not have Alloy 600-equivalent materials in the tubes or tubesheet cladding, including in tube-to-tubesheet weld repairs. The Oconee Units 1, 2 and 3 replacement steam generators have tubesheet clad with I-52 (Alloy 690) material and, as a result, has a chromium content >22%. The tubes are Alloy 690 with a minimum of 28.5% chromium specified. Therefore, primary water stress corrosion cracking is not a concern due to the high chromium content of both the tube and cladding, and there is no risk of cracking initiating in the tube-to-tubesheet welds.

3.1.2.2.12 Cracking Due to Irradiation-Assisted Stress Corrosion Cracking

NUREG-2192:

GALL-SLR Report AMP XI.M9, "BWR Vessel Internals," manages aging degradation of nickel alloy and SS, including associated welds, which are used in BWR vessel internal components. When exposed to the BWR vessel environment, these materials can experience cracking due to IASCC. The existing Boiling Water Reactor Vessel and Internals Project (BWRVIP) examination guidelines are mainly based on aging evaluation of BWR vessel internals for operation up to 60 years. However, increases in neutron fluence during the SLR term may need to be assessed for supplemental inspections of BWR vessel internals to adequately manage cracking due to IASCC. Therefore, the applicant should perform an evaluation to determine whether supplemental inspections are necessary in addition to those recommended in the existing BWRVIP examination guidelines. If the applicant determines that supplemental inspections are not necessary, the applicant should provide adequate technical justification for the determination. If supplemental inspections are determined necessary for BWR vessel internals, the applicant identifies the components to be inspected and performs supplemental inspections to adequately *manage IASCC. In addition, the applicant should confirm the adequacy of any necessary supplemental inspections and enhancements to the BWR Vessel Internals Program.*

Evaluation

Not applicable - BWR only.

3.1.2.2.13 Loss of Fracture Toughness Due to Neutron Irradiation or Thermal Aging Embrittlement

NUREG-2192:

GALL-SLR Report AMP XI.M9 manages aging degradation of nickel alloy and SS, including associated welds, which are used in BWR vessel internal components. When exposed to the BWR vessel environment, these materials can experience loss of fracture toughness due to neutron irradiation embrittlement. In addition, CASS, precipitation-hardened (PH) martensitic SS (e.g., 15-5 and 17-4 PH steel) and martensitic SS (e.g., 403, 410, 431 steel) can experience loss of fracture toughness due to neutron irradiation or thermal aging embrittlement.

The existing BWRVIP examination guidelines are mainly based on aging evaluation of BWR vessel internals for operation up to 60 years. Increases in neutron fluence and thermal embrittlement during the SLR term may need to be assessed for supplemental inspections of BWR vessel internals to adequately manage loss of fracture toughness due to neutron irradiation or thermal aging embrittlement. Therefore, the applicant should perform an evaluation to determine whether supplemental inspections are necessary in addition to those recommended in the existing BWRVIP examination guidelines. If the applicant determines that supplemental inspections are not necessary, the applicant should provide adequate technical justification for the determination. If supplemental inspections are determined necessary for BWR vessel internals, the applicant should identify the components to be inspected and perform supplemental inspections to adequately manage loss of fracture toughness. In addition, the applicant should confirm the adequacy of any necessary supplemental inspections and enhancements to the BWR Vessel Internals Program.

Evaluation

Not applicable - BWR only.

3.1.2.2.14 Loss of Preload Due to Thermal or Irradiation-Enhanced Stress Relaxation

NUREG-2192:

GALL-SLR Report AMP XI.M9 manages loss of preload due to thermal or irradiation-enhanced stress relaxation in BWR core plate rim holddown bolts. The issue is applicable to BWR designed light water reactors that employ rim holddown bolts as the means for protecting the reactor's core plate from the consequences of lateral movement. The potential for such movement, if left *unmanaged, could impact the ability of the reactor to be brought to a safe shutdown condition during an anticipated transient occurrence or during a postulated design-basis accident or seismic event. This issue is not applicable to BWR reactor designs that use wedges as the means of precluding lateral movement of the core plate because the wedges are fixed in place and are not subject to this type of aging effect and mechanism combination.*

GALL-SLR Report AMP XI.M9 indicates that the inspections in the BWRVIP topical report, "BWR Vessel and Internals Project, BWR Core Plate Inspection and Flaw Evaluation Guidelines (BWRVIP-25)," are used to manage loss of preload due to thermal or irradiation-enhanced stress relaxation in BWR designs with core plate rim holddown bolts. However, in previous license renewal applications (LRAs), some applicants have identified that the inspection bases for managing loss of preload in BWRVIP-25 may not be capable of gaining access to the rim holddown bolts or are not sufficient to detect loss of preload on the components. For applicants that have identified this issue in their past LRAs, the applicants either committed to modifying the plant design to install wedges in the core plate designs or to submit an inspection plan, with a supporting core plate rim holddown bolt preload analysis for NRC approval at least 2 years prior to entering into the initial period of extended operation for the facility.

If an existing NRC-approved analysis for the bolts exists in the CLB and conforms to the definition of a TLAA, the applicant should identify the analysis as a TLAA for the SLRA and demonstrate how the analysis is acceptable in accordance with either 10 CFR 54.21(c)(1)(i), (ii), or (iii). Otherwise, if a new analysis will be performed to support an updated augmented inspection basis for the bolts for the subsequent period of extended operation, the NRC staff recommends that a license renewal commitment be placed in the FSAR Supplement for the applicant to submit both the inspection plan and the supporting loss of preload analysis to the NRC staff for approval at least 2 years prior to entering into the subsequent period of extended operation for the facility. If loss of preload in the bolts is managed with an AMP that correlates to GALL-SLR Report AMP XI.M9, the inspection basis in the applicable BWRVIP report is reviewed for continued validity, or else augmented as appropriate.

<u>Evaluation</u>

Not applicable - BWR only.

3.1.2.2.15 Loss of Material Due to General, Crevice or Pitting Corrosion and Cracking Due to Stress Corrosion Cracking

<u>NUREG-2192:</u>

Loss of material due to general (steel only), crevice, or pitting corrosion and cracking due to SCC (SS only) can occur in steel and SS piping and piping components exposed to concrete. Concrete provides a high alkalinity environment that can mitigate the effects of loss of material for steel piping, thereby significantly reducing the corrosion rate. However, if water intrudes through the concrete, the pH can be reduced and ions that promote loss of material such as chlorides, which can penetrate the protective oxide layer created in the high alkalinity environment, can reach the surface of the metal. Carbonation can reduce the pH within concrete.

The rate of carbonation is reduced by using concrete with a low water-to-cement ratio and low permeability. Concrete with low permeability also reduces the potential for the penetration of water. Adequate air entrainment improves the ability of the concrete to resist freezing and thawing cycles and therefore reduces the potential for cracking and intrusion of water. Cracking due to SCC, as well as pitting and crevice corrosion can occur due to halides present in the water that penetrates to the surface of the metal.

If the following conditions are met, loss of material is not considered to be an applicable aging effect for steel: (a) attributes of the concrete are consistent with American Concrete Institute (ACI) 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG–1557; (b) plant-specific OE indicates no degradation of the concrete that could lead to penetration of water to the metal surface; and (c) the piping is not potentially exposed to groundwater. For SS components loss of material and cracking due to SCC are not considered to be applicable aging effects as long as the piping is not potentially exposed to groundwater. Where these conditions are not met, loss of material due to general (steel only), crevice or pitting corrosion and cracking due to SCC (SS only) are identified as applicable aging effects. GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," describes an acceptable program to manage these aging effects.

Evaluation

[3.1.1-105], [3.1.1-115] – There are no stainless steel piping or piping components exposed to concrete in the ONS Reactor Coolant System.

3.1.2.2.16 Loss of Material Due to Pitting and Crevice Corrosion in Stainless Steel and Nickel Alloys

NUREG-2192:

Loss of material due to pitting and crevice corrosion could occur in indoor or outdoor SS and nickel alloy piping, piping components, and tanks exposed to any air, condensation, or underground environment when the component is: (a) uninsulated; (b) insulated; (c) in the vicinity of insulated components; or (d) in the vicinity of potentially transportable halogens. Loss of material due to pitting and crevice corrosion can occur on SS and nickel alloys in environments containing sufficient halides (e.g., chlorides) in the presence of moisture.

Insulated SS and nickel alloy components exposed to air, condensation, or underground environments are susceptible to loss of material due to pitting or crevice corrosion if the insulation contains certain contaminants. Leakage of fluids through mechanical connections such as bolted flanges and valve packing can result in contaminants leaching onto the component surface or the surfaces of other components below the component. For outdoor insulated SS and nickel alloy components, rain and changing weather conditions can result in moisture intrusion into the insulation.

Plant-specific OE and the condition of SS and nickel alloy components are evaluated to determine if prolonged exposure to the plant-specific environments has resulted in pitting or crevice corrosion. Loss of material due to pitting and crevice corrosion is not an aging effect requiring management for SS and nickel alloy components if (a) plant-specific OE does not reveal a history of loss of material due to pitting or crevice corrosion; and (b) a one-time inspection demonstrates that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the subsequent period of extended operation. The applicant documents the results of the plant-specific OE review in the SLRA.

In the environment of air-indoor controlled, pitting and crevice corrosion is only expected to occur as the result of a source of moisture and halides. Inspections focus on the most susceptible locations.

The GALL-SLR Report recommends further evaluation of SS and nickel alloy piping and piping components exposed to an air, condensation, or underground environment to determine whether an AMP is needed to manage the aging effect of loss of material due to pitting and crevice corrosion. GALL-SLR Report AMP XI.M32, "One-Time Inspection," describes an acceptable program to demonstrate that loss of material due to pitting and crevice corrosion is not occurring at a rate that will affect the intended function of the components. If loss of material due to pitting or crevice corrosion has occurred and is sufficient to potentially affect the intended function of an SSC, GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," describes an acceptable program to manage loss of material due to pitting or crevice corrosion. The timing of the one-time or periodic inspections is consistent with that recommended in the AMP selected by the applicant during the development of the SLRA. For example, one-time inspections would be conducted between the 50th and 60th year of operation, as recommended by the "detection of aging effects" program element in AMP XI.M32.

The applicant may establish that loss of material due to pitting and crevice corrosion is not an aging effect requiring management by demonstrating that a barrier coating isolates the component from aggressive environments. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," describes an acceptable program to manage the integrity of a barrier coating.

Evaluation

Plant-specific OE associated with stainless steel and nickel alloy piping, piping components in the reactor vessel, internals, and reactor coolant system has been evaluated to determine if prolonged exposure to air-indoor uncontrolled or condensation has resulted in loss of material due to pitting or crevice corrosion. Loss of material has not been identified as an aging effect at ONS for the stainless steel and nickel alloy components in these environments, or as a result of transportable halogens, indicating that these environments do not contain sufficient halides (e.g., chlorides) in the presence of moisture to result in loss of material.

[3.1.1-136] – The *One-Time Inspection* (B2.1.20) program will be implemented to demonstrate that the aging effect of loss of material is not occurring in stainless steel and nickel alloy piping, piping components exposed to air or condensation in the reactor vessel, internals, and reactor coolant system.

3.1.2.2.17 Quality Assurance for Aging Management of Non-Safety Related Components

NUREG-2192:

Acceptance criteria are described in BTP IQMB-1 (Appendix A.2 of this SRP-SLR). Evaluation

Quality Assurance provisions applicable to SLR are discussed in Appendix B1.3, Quality Assurance Program and Administrative Controls.

3.1.2.2.18 Ongoing Review of Operating Experience

NUREG-2192:

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

Evaluation

The operating experience process and acceptance criteria are described in Appendix B1.4, Operating Experience.

Results Tables: Reactor Vessel, Internals, and Reactor Coolant System

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-001	Steel reactor vessel closure flange assembly components exposed to air-indoor uncontrolled	Cumulative fatigue damage: cracking due to fatigue, cyclic loading	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.1.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of steel reactor vessel closure flange assembly components exposed to air-indoor uncontrolled is a TLAA. See further evaluation in Section 3.1.2.2.1.
3.1.1-002	Nickel alloy tubes and sleeves exposed to reactor coolant, secondary feedwater/steam	Cumulative fatigue damage: cracking due to fatigue, cyclic loading	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.1.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of nickel alloy components exposed to reactor coolant or secondary feedwater/steam is a TLAA. See further evaluation in Section 3.1.2.2.1.
3.1.1-003	Stainless steel, nickel alloy reactor vessel internal components exposed to reactor coolant, neutron flux	Cumulative fatigue damage: cracking due to fatigue, cyclic loading	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.1.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of stainless steel reactor vessel internal components exposed to reactor coolant and neutron flux is a TLAA. See further evaluation in Section 3.1.2.2.1.
3.1.1-004	Steel pressure vessel support skirt and attachment welds	Cumulative fatigue damage: cracking due to fatigue, cyclic loading	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.1.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of steel reactor vessel support skirt components exposed to air-indoor uncontrolled is a TLAA. See further evaluation in Section 3.1.2.2.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-005	Steel, stainless steel, steel (with stainless steel or nickel alloy cladding) steam generator components, pressurizer relief tank components, piping components, bolting	Cumulative fatigue damage: cracking due to fatigue, cyclic loading	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.1.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of steel or stainless steel components is a TLAA. See further evaluation in Section 3.1.2.2.1.
3.1.1-006	Stainless steel, steel (with or without nickel alloy or stainless steel cladding), nickel alloy reactor coolant pressure boundary components: piping, piping components; other pressure retaining components exposed to reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclic loading	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.1.2.2.1)	Not applicable - BWR only
3.1.1-007	Stainless steel, steel (with or without nickel alloy or stainless steel cladding), nickel alloy reactor vessel components: nozzles; penetrations; safe ends; thermal sleeves; vessel shells, heads and welds exposed to reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclic loading	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.1.2.2.1)	Not applicable - BWR only

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-008	Stainless steel, steel (with or without nickel alloy or stainless steel cladding), nickel alloy steam generator components exposed to reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclic loading	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.1.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of stainless steel, steel (with nickel alloy or stainless steel cladding) or nickel alloy steam generator components exposed to reactor coolant is a TLAA. See further evaluation in Section 3.1.2.2.1.
3.1.1-009	Stainless steel, steel (with or without nickel alloy or stainless steel cladding), nickel alloy reactor coolant pressure boundary piping, piping components; other pressure retaining components exposed to reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclic loading	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.1.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of stainless steel or steel (with stainless steel cladding) reactor coolant pressure boundary components exposed to reactor coolant is a TLAA. See further evaluation in Section 3.1.2.2.1.
3.1.1-010	Steel (with or without nickel alloy or stainless steel cladding), stainless steel, or nickel alloy reactor vessel components: nozzles; penetrations; pressure housings; safe ends; thermal sleeves; vessel shells, heads and welds exposed to reactor coolant	Cumulative fatigue damage: cracking due to fatigue, cyclic loading	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.1.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of steel (with stainless steel cladding), stainless steel or nickel alloy reactor vessel components exposed to reactor coolant is a TLAA. See further evaluation in Section 3.1.2.2.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-011	Steel or stainless steel pump and valve closure bolting exposed to high temperatures and thermal cycles	Cumulative fatigue damage: cracking due to fatigue, cyclic loading	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.1.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of steel or stainless steel pump and valve closure bolting exposed to high temperatures and thermal cycles is a TLAA. See further evaluation in Section 3.1.2.2.1.
3.1.1-012	Steel steam generator components: upper and lower shells, transition cone; new transition cone closure weld exposed to secondary feedwater or steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” and AMP XI.M2, “Water Chemistry”	Yes (SRP-SLR Sections 3.1.2.2.2.1 and 3.1.2.2.2.2)	Not applicable to ONS Steam Generators. The associated NUREG-2191 aging items are not used.
3.1.1-013	Steel (with or without stainless steel or nickel alloy cladding) reactor vessel beltline shell, nozzle, and weld components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, SRP-SLR Section 4.2 Reactor Pressure Vessel Neutron Embrittlement	Yes (SRP-SLR Section 3.1.2.2.3.1)	Consistent with NUREG-2191. Loss of fracture toughness of steel (with stainless steel cladding) reactor vessel components exposed to reactor coolant and neutron flux is a TLAA. See further evaluation in Section 3.1.2.2.3.1.
3.1.1-014	Steel (with or without cladding) reactor vessel beltline shell, nozzle, and weld components; exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	AMP XI.M31, “Reactor Vessel Material Surveillance,” and X.M2, “Neutron Fluence Monitoring”	Yes (SRP-SLR Section 3.1.2.2.3.2)	Consistent with NUREG-2191 with exceptions. See further evaluation in Section 3.1.2.2.3.2. Exceptions apply to the NUREG-2191 recommendations for the *Reactor Vessel Material Surveillance* (B2.1.19) program implementation.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-015	Stainless steel Babcock & Wilcox (including CASS, martensitic SS, and PH SS) and nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Reduction in fracture toughness due to neutron irradiation	TLAA, SRP-SLR Section 4.7 Other Plant-Specific TLAAs	Yes (SRP-SLR Section 3.1.2.2.3.3)	Consistent with NUREG-2191. Reduction in fracture toughness due to neutron irradiation is a TLAA. See further evaluation in Section 3.1.2.2.3.
3.1.1-016	Stainless steel or nickel alloy reactor vessel top head enclosure flange leakage detection line exposed to air-indoor uncontrolled, reactor coolant leakage	Cracking due to SCC, IGSCC	AMP XI.M32, "One-Time Inspection," or AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes (SRP-SLR Section 3.1.2.2.4.1)	Not applicable - BWR only.
3.1.1-017	Stainless steel isolation condenser components exposed to reactor coolant	Cracking due to SCC, IGSCC	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	Yes (SRP-SLR Section 3.1.2.2.4.2)	Not Applicable - BWR only
3.1.1-018	Reactor vessel shell fabricated of SA508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process exposed to reactor coolant	Crack growth due to cyclic loading	TLAA, SRP-SLR Section 4.7 Other Plant-Specific TLAAs	Yes (SRP-SLR Section 3.1.2.2.5)	Consistent with NUREG-2191. Crack growth due to cyclic loading (underclad cracking) is a TLAA. See further evaluation in Section 3.1.2.2.5.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-019	Stainless steel reactor vessel bottom-mounted instrument guide tubes (external to reactor vessel) exposed to reactor coolant	Cracking due to stress corrosion cracking	Plant-specific aging management program	Yes (SRP-SLR Section 3.1.2.2.6.1)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock and Wilcox reactors. The associated NUREG-2191 aging items are not used.
3.1.1-020	Cast austenitic stainless steel Class 1 piping, piping components exposed to reactor coolant	Cracking due to stress corrosion cracking	AMP XI.M2, “Water Chemistry” and plant-specific aging management program	Yes (SRP-SLR Section 3.1.2.2.6.2)	Consistent with NUREG-2191. Cracking of cast austenitic stainless steel Class 1 piping, piping components exposed to reactor coolant is managed by the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* (B2.1.1) program and the *Water Chemistry* (B2.1.2) program. See further evaluation in Section 3.1.2.2.6.2.
3.1.1-021	Steel and stainless steel isolation condenser components exposed to reactor coolant	Cracking due to cyclic loading	AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD”	Yes (SRP-SLR Section 3.1.2.2.7)	Not applicable - BWR only.
3.1.1-022	Steel steam generator feedwater impingement plate and support exposed to secondary feedwater	Loss of material due to erosion	Plant-specific aging management program	Yes (SRP-SLR Section 3.1.2.2.8)	Not applicable to ONS steam generators. The associated NUREG-2191 aging items are not used.
3.1.1-025	Steel (with nickel alloy cladding) or nickel alloy steam generator primary side components: divider plate and tube-to-tube sheet welds exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M2, “Water Chemistry”, and AMP XI.M19, “Steam Generators.” In addition, a plant-specific program is to be evaluated.	Yes (SRP-SLR Sections 3.1.2.2.11.1 and 3.1.2.2.11.2)	Consistent with NUREG-2191. See further evaluation in Section 3.1.2.2.11.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-028	Westinghouse-specific "Existing Programs" components: Stainless steel, nickel alloy, and X-750 control rod guide tube support pins (split pins) exposed to reactor coolant and neutron flux.	Loss of material due to wear; cracking due to stress corrosion cracking, IASCC, fatigue	AMP XI.M16A, "PWR Vessel Internals," and AMP XI.M2, "Water Chemistry" (for stress corrosion cracking mechanisms only)	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock and Wilcox reactors. The associated NUREG-2191 aging items are not used.
3.1.1-029	Nickel alloy core shroud and core plate access hole cover (welded covers) exposed to reactor coolant	Cracking due to stress corrosion cracking, IGSCC, IASCC	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water Chemistry"	Yes (SRP-SLR Section 3.1.2.2.12)	Not applicable - BWR only
3.1.1-030	Stainless steel, nickel alloy penetration: drain line exposed to reactor coolant	Cracking due to stress corrosion cracking, IGSCC, cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry" (stress corrosion cracking, IGSCC mechanisms only)	No	Not applicable - BWR only
3.1.1-031	Steel and stainless steel isolation condenser components exposed to reactor coolant	Loss of material due to general (steel only), pitting, crevice corrosion, wear	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No	Not applicable - BWR only

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-033	Stainless steel, steel with stainless steel cladding Class 1 reactor coolant pressure boundary components exposed to reactor coolant	Cracking due to stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No	Consistent with NUREG-2191.
3.1.1-034	Stainless steel, steel with stainless steel cladding pressurizer relief tank (tank shell and heads, flanges, nozzles) exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No	Not applicable. The tank performing this function at ONS is called the quench tank, and is evaluated as part of the Coolant Storage System. The associated NUREG-2191 aging items are not used.
3.1.1-035	Stainless steel, steel with stainless steel cladding reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings exposed to reactor coolant	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Consistent with NUREG-2191.
3.1.1-036	Steel, stainless steel pressurizer integral support exposed to any environment	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Consistent with NUREG-2191.
3.1.1-037	Steel reactor vessel flange	Loss of material due to wear	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Consistent with NUREG-2191.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-038	Cast austenitic stainless steel Class 1 valve bodies and bonnets exposed to reactor coolant >250 °C (>482 °F)	Loss of fracture toughness due to thermal aging embrittlement	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Consistent with NUREG-2191.
3.1.1-039	Stainless steel, steel (with or without nickel alloy or stainless steel cladding), nickel alloy Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant	Cracking due to stress corrosion cracking (for stainless steel or nickel alloy surfaces exposed to reactor coolant only), IGSCC (for stainless steel or nickel alloy surfaces exposed to reactor coolant only), or thermal, mechanical, or vibratory loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," AMP XI.M2, "Water Chemistry," and XI.M35, "ASME Code Class 1 Small-Bore Piping"	No	Consistent with NUREG-2191.
3.1.1-040	Steel with stainless steel or nickel alloy cladding; or stainless steel pressurizer components exposed to reactor coolant	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Consistent with NUREG-2191.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-040a	Nickel alloy core support pads; core guide lugs exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No	Consistent with NUREG-2191.
3.1.1-041	Nickel alloy core shroud and core plate access hole cover (mechanical covers) exposed to reactor coolant	Cracking due to stress corrosion cracking, IGSCC, IASCC	AMP XI.M9, "BWR Vessel Internals," and AMP XI.M2, "Water Chemistry"	Yes (SRP-SLR Section 3.1.2.2.12)	Not applicable - BWR only.
3.1.1-042	Steel with stainless steel or nickel alloy cladding; stainless steel primary side components; steam generator upper and lower heads, and tube sheet welds; pressurizer components exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No	Consistent with NUREG-2191.
3.1.1-043	Stainless steel and nickel alloy reactor vessel internals exposed to reactor coolant	Loss of material due to pitting, crevice corrosion	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry"	No	Not applicable - BWR only.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-044	Steel steam generator secondary manway and handhole cover seating surfaces exposed to treated water, steam	Loss of material due to erosion	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Consistent with NUREG-2191.
3.1.1-045	Nickel alloy, steel with nickel alloy cladding reactor coolant pressure boundary components exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD," and AMP XI.M2, "Water Chemistry," and, for nickel-alloy, AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in RCPB Components (PWRs Only)"	No	Consistent with NUREG-2191.
3.1.1-046	Stainless steel, nickel alloy control rod drive head penetration pressure housings, reactor vessel nozzles, nozzle safe ends and welds exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD," and AMP XI.M2, "Water Chemistry," and, for nickel-alloy, AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced corrosion in RCPB Components (PWRs Only)"	No	Consistent with NUREG-2191.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-047	Stainless steel, nickel alloy control rod drive head penetration pressure housing exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD," and AMP XI.M2, "Water Chemistry"	No	Consistent with NUREG-2191.
3.1.1-048	Steel external surfaces: reactor vessel top head, reactor vessel bottom head, reactor coolant pressure boundary piping or components adjacent to dissimilar metal (Alloy 82/182) welds exposed to air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion," and AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid- Induced Corrosion in RCPB Components (PWRs Only)"	No	Consistent with NUREG-2191.
3.1.1-049	Steel reactor vessel, piping, piping components in the reactor coolant pressure boundary of PWRs, and applicable exterior attachments, or steel steam generators in PWRs: external surfaces or closure bolting exposed to air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No	Consistent with NUREG-2191.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-050	Cast austenitic stainless steel Class 1 piping, piping components (including pump casings and control rod drive pressure housings) exposed to reactor coolant >250 °F (>482 °C)	Loss of fracture toughness due to thermal aging embrittlement	AMP XI.M12, “Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)”	No	Consistent with NUREG-2191.
3.1.1-051a	Stainless steel, nickel alloy Babcock & Wilcox reactor internal Primary components exposed to reactor coolant, neutron flux	Cracking due to stress corrosion cracking, IASCC, fatigue	AMP XI.M16A, “PWR Vessel Internals,” and AMP XI.M2, “Water Chemistry” (for stress corrosion cracking mechanisms only)	Yes (SRP-SLR Section 3.1.2.2.9)	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *PWR Vessel Internals* (B2.1.7) program implementation.
3.1.1-051b	Stainless steel, nickel alloy Babcock & Wilcox reactor internal Expansion components exposed to reactor coolant, neutron flux	Cracking due to stress corrosion cracking, IASCC, fatigue, overload	AMP XI.M16A, “PWR Vessel Internals,” and AMP XI.M2, “Water Chemistry” (for stress corrosion cracking mechanisms only)	Yes (SRP-SLR Section 3.1.2.2.9)	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *PWR Vessel Internals* (B2.1.7) program implementation.
3.1.1-052a	Stainless steel, nickel alloy Combustion Engineering reactor internal Primary components exposed to reactor coolant, neutron flux	Cracking due to stress corrosion cracking, IASCC, fatigue	AMP XI.M16A, “PWR Vessel Internals,” and AMP XI.M2, “Water Chemistry” (for stress corrosion cracking mechanisms only)	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-052b	Stainless steel, nickel alloy Combustion Engineering reactor internal Expansion components exposed to reactor coolant, neutron flux	Cracking due to stress corrosion cracking, IASCC, fatigue	AMP XI.M16A, “PWR Vessel Internals,” and AMP XI.M2, “Water Chemistry” (for stress corrosion cracking mechanisms only)	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.
3.1.1-052c	Stainless steel, nickel alloy Combustion Engineering reactor internal Existing Programs components exposed to reactor coolant, neutron flux	Cracking due to stress corrosion cracking, IASCC, fatigue	AMP XI.M16A, “PWR Vessel Internals,” and AMP XI.M2, “Water Chemistry” (for stress corrosion cracking mechanisms only)	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.
3.1.1-053a	Stainless steel, nickel alloy Westinghouse reactor internal Primary components exposed to reactor coolant, neutron flux	Cracking due to stress corrosion cracking, IASCC, fatigue	AMP XI.M16A, “PWR Vessel Internals,” and AMP XI.M2, “Water Chemistry” (for stress corrosion cracking mechanisms only)	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.
3.1.1-053b	Stainless steel Westinghouse reactor internal Expansion components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, IASCC, fatigue	AMP XI.M16A, “PWR Vessel Internals,” and AMP XI.M2, “Water Chemistry” (for stress corrosion cracking mechanisms only)	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.
3.1.1-053c	Stainless steel, nickel alloy Westinghouse reactor internal Existing Programs components exposed to reactor coolant, neutron flux	Cracking due to stress corrosion cracking, IASCC, fatigue	AMP XI.M16A, “PWR Vessel Internals,” and AMP XI.M2, “Water Chemistry” (for stress corrosion cracking mechanisms only)	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-054	Stainless steel Westinghouse-design bottom mounted instrument system flux thimble tubes (with or without chrome plating) exposed to reactor coolant and neutron flux	Loss of material due to wear	AMP XI.M37, “Flux Thimble Tube Inspection”	No	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.
3.1.1-055a	Stainless steel, nickel alloy Babcock and Wilcox reactor internal No Additional Measures components exposed to reactor coolant, neutron flux	No additional aging management for reactor internal No Additional Measures components unless required by ASME Section XI, Examination Category B-N-3 or relevant operating experience exists	AMP XI.M16A, “PWR Vessel Internals”	Yes (SRP-SLR Section 3.1.2.2.9)	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *PWR Vessel Internals* (B2.1.7) program implementation.
3.1.1-055b	Stainless steel, nickel alloy Combustion Engineering reactor internal No Additional Measures components exposed to reactor coolant, neutron flux	No additional aging management for reactor internal No Additional Measures components unless required by ASME Section XI, Examination Category B-N-3 or relevant operating experience exists	AMP XI.M16A, “PWR Vessel Internals”	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-055c	Stainless steel, nickel alloy Westinghouse reactor internal No Additional Measures components exposed to reactor coolant, neutron flux	No additional aging management for reactor internal No Additional Measures components unless required by ASME Section XI, Examination Category B-N-3 or relevant operating experience exists	AMP XI.M16A, "PWR Vessel Internals"	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.
3.1.1-056a	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Combustion Engineering reactor internal Primary components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; changes in dimensions due to void swelling, distortion; loss of preload due to thermal and irradiation-enhanced stress relaxation, creep; loss of material due to wear	AMP XI.M16A, "PWR Vessel Internals"	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-056b	Stainless steel (SS, including CASS, PH SS or martensitic SS) Combustion Engineering Expansion reactor internal components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; changes in dimensions due to void swelling, distortion; loss of preload due to thermal and irradiation-enhanced stress relaxation, creep; loss of material due to wear	AMP XI.M16A, “PWR Vessel Internals”	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-056c	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Combustion Engineering reactor internal Existing Programs components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; changes in dimensions due to void swelling, distortion; loss of preload due to thermal and irradiation-enhanced stress relaxation, creep; loss of material due to wear	AMP XI.M16A, “PWR Vessel Internals”	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-058a	Stainless steel (SS, including CASS, PH SS or martensitic SS), nickel alloy Babcock & Wilcox reactor internal "Primary" components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to wear; or loss of material due to wear	AMP XI.M16A, "PWR Vessel Internals"	Yes (SRP-SLR Section 3.1.2.2.9)	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *PWR Vessel Internals* (B2.1.7) program implementation.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-058b	Stainless steel (SS, including CASS, PH SS or martensitic SS), nickel alloy Babcock & Wilcox reactor internal Expansion components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling, or distortion; or loss of preload due to thermal and irradiation-enhanced stress relaxation, or creep; or loss of material due to wear	AMP XI.M16A, "PWR Vessel Internals"	Yes (SRP-SLR Section 3.1.2.2.9)	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *PWR Vessel Internals* (B2.1.7) program implementation.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-059a	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Westinghouse reactor internal Primary components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; changes in dimensions due to void swelling, distortion; loss of preload due to thermal and irradiation-enhanced stress relaxation, creep; loss of material due to wear	AMP XI.M16A, “PWR Vessel Internals”	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-059b	Stainless steel (SS, including CASS, PH SS or martensitic SS) Westinghouse reactor internal Expansion components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; changes in dimensions due to void swelling, distortion; loss of preload due to thermal and irradiation-enhanced stress relaxation, creep; loss of material due to wear	AMP XI.M16A, “PWR Vessel Internals”	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-059c	Stainless steel (SS, including CASS, PH SS or martensitic SS), nickel alloy, or stellite Westinghouse reactor internal "Existing Programs" components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; changes in dimensions due to void swelling, distortion; loss of preload due to thermal and irradiation-enhanced stress relaxation, creep; loss of material due to wear	AMP XI.M16A, "PWR Vessel Internals"	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. ONS Units 1, 2 and 3 utilize Babcock & Wilcox reactors. The associated NUREG-2191 aging items are not used.
3.1.1-060	Steel piping, piping components exposed to reactor coolant	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No	Not applicable - BWR only
3.1.1-061	Steel steam generator steam nozzle and safe end, feedwater nozzle and safe end. AFW nozzles and safe ends exposed to secondary feedwater/steam	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No	Consistent with NUREG-2191.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-062	High-strength steel, stainless steel closure bolting; stainless steel control rod drive head penetration flange bolting exposed to air-indoor uncontrolled	Cracking due to stress corrosion cracking	AMP XI.M18, "Bolting Integrity"	No	Consistent with NUREG-2191.
3.1.1-063	Steel or stainless steel closure bolting exposed to air - indoor uncontrolled	Loss of material due to general (steel only), pitting, crevice corrosion, wear	AMP XI.M18, "Bolting Integrity"	No	Not applicable - BWR only.
3.1.1-064	Steel or stainless steel closure bolting exposed to air - indoor uncontrolled	Loss of material due to general (steel only), pitting, crevice corrosion, wear	AMP XI.M18, "Bolting Integrity"	No	Consistent with NUREG-2191.
3.1.1-065	Stainless steel control rod drive head penetration flange bolting exposed to air - indoor uncontrolled	Loss of material due to wear	AMP XI.M18, "Bolting Integrity"	No	Not applicable. ONS has no stainless steel control rod drive head penetration flange bolting exposed to air-indoor uncontrolled in the Reactor Vessel, Internals, and Reactor Coolant System. The associated NUREG-2191 aging items are not used.
3.1.1-066	Steel, stainless steel closure bolting; stainless steel control rod drive head penetration flange bolting exposed to air-indoor uncontrolled	Loss of preload due to thermal effects, gasket creep, self-loosening	AMP XI.M18, "Bolting Integrity"	No	Consistent with NUREG-2191.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-067	Steel or stainless steel closure bolting exposed to air - indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, self-loosening	AMP XI.M18, “Bolting Integrity”	No	Consistent with NUREG-2191.
3.1.1-068	Nickel alloy steam generator tubes exposed to secondary feedwater or steam	Changes in dimension (denting) due to corrosion of carbon steel tube support plate.	AMP XI.M19, “Steam Generators,” and AMP XI.M2, “Water Chemistry”	No	Not applicable. ONS has stainless steel tube support plates that do no promote formation of corrosion products that cause denting.
3.1.1-069	Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater or steam	Cracking due to outer diameter stress corrosion cracking, intergranular attack	AMP XI.M19, “Steam Generators,” and AMP XI.M2, “Water Chemistry”	No	Consistent with NUREG-2191.
3.1.1-070	Nickel alloy steam generator tubes, repair sleeves, and tube plugs exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	AMP XI.M19, “Steam Generators,” and AMP XI.M2, “Water Chemistry”	No	Consistent with NUREG-2191.
3.1.1-071	Steel, chrome plated steel, stainless steel, nickel alloy steam generator U-bend supports including antivibration bars exposed to secondary feedwater or steam	Cracking due to stress corrosion cracking or other mechanism(s); loss of material due general (steel only), pitting, crevice corrosion	AMP XI.M19, “Steam Generators,” and AMP XI.M2, “Water Chemistry”	No	Not applicable to ONS steam generators. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-072	Steel steam generator tube support plate, tube bundle wrapper, supports and mounting hardware exposed to secondary feedwater or steam	Loss of material due to general, pitting, crevice corrosion, erosion, ligament cracking due to corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry" (corrosion based aging effects and mechanisms only)	No	Consistent with NUREG-2191.
3.1.1-073	Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary feedwater or steam	Loss of material due to wastage, pitting corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No	Not applicable to ONS steam generators. The associated NUREG-2191 aging items are not used.
3.1.1-074	Steel steam generator upper assembly and separators including feedwater inlet ring and support exposed to secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No	Not applicable to ONS steam generators. The associated NUREG-2191 aging items are not used.
3.1.1-075	Steel steam generator tube support lattice bars exposed to secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion, general corrosion	AMP XI.M19, "Steam Generators," and AMP XI.M2, "Water Chemistry"	No	Not applicable to ONS steam generators. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-076	Steel, chrome plated steel, stainless steel, nickel alloy steam generator U-bend supports including anti-vibration bars exposed to secondary feedwater or steam	Loss of material due to wear, fretting	AMP XI.M19, “Steam Generators”	No	Not applicable to ONS steam generators. The associated NUREG-2191 aging items are not used.
3.1.1-077	Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater or steam	Loss of material due to wear, fretting	AMP XI.M19, “Steam Generators”	No	Consistent with NUREG-2191.
3.1.1-078	Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary feedwater or steam	Cracking due to SCC	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection,” or AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD”	No	Consistent with NUREG-2191.
3.1.1-079	Stainless steel; steel with nickel alloy or stainless steel cladding; and nickel alloy reactor coolant pressure boundary components exposed to reactor coolant	Loss of material due to pitting, crevice corrosion	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable - BWR only.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-080	Stainless steel or steel with stainless steel cladding pressurizer relief tank: tank shell and heads, flanges, nozzles (none-ASME Section XI components) exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Not applicable. The ONS tank performing this function is called the quench tank, and is addressed with the Condensate Storage System. The associated NUREG-2191 aging items are not used.
3.1.1-081	Stainless steel pressurizer spray head exposed to reactor coolant	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Consistent with NUREG-2191.
3.1.1-082	Nickel alloy pressurizer spray head exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Not applicable. The ONS pressurizer spray head is not constructed of nickel alloy. See item 3.1.1-081. The associated NUREG-2191 aging items are not used.
3.1.1-083	Steel steam generator shell assembly exposed to secondary feedwater or steam	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Consistent with NUREG-2191.
3.1.1-084	Steel top head enclosure (without cladding): top head, top head nozzles (vent, top head spray, RCIC, spare) exposed to reactor coolant	Loss of material due to general, pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Not applicable - BWR only.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-085	Stainless steel, nickel alloy, and steel with nickel alloy or stainless steel cladding reactor vessel flanges, nozzles, penetrations, safe ends, vessel shells, heads and welds exposed to reactor coolant	Loss of material due to pitting, crevice corrosion	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable - BWR only.
3.1.1-086	Stainless steel steam generator primary side divider plate exposed to reactor coolant	Cracking due to SCC	AMP XI.M2, “Water Chemistry”	No	Not applicable to once through steam generators. The associated NUREG-2191 aging items are not used.
3.1.1-087	Stainless steel, nickel alloy PWR reactor internal components exposed to reactor coolant, neutron flux	Loss of material due to pitting, crevice corrosion	AMP XI.M2, “Water Chemistry”	No	Consistent with NUREG-2191.
3.1.1-088	Stainless steel; steel with nickel alloy or stainless steel cladding; and nickel alloy reactor coolant pressure boundary components exposed to reactor coolant	Loss of material due to pitting, crevice corrosion	AMP XI.M2, “Water Chemistry”	No	Consistent with NUREG-2191.
3.1.1-089	Steel piping, piping components exposed to closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, “Closed Treated Water Systems”	No	Not applicable. ONS has no stainless steel piping or piping components exposed to closed-cycle cooling water in the Reactor Vessel, Internals, and Reactor Coolant System. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-090	Copper alloy piping, piping components exposed to closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No	Not applicable. ONS has no copper alloy piping or piping components exposed to closed-cycle cooling water in the Reactor Vessel, Internals, and Reactor Coolant System. The associated NUREG-2191 aging items are not used.
3.1.1-091	Steel (including high-strength steel) reactor vessel closure flange assembly components (including flanges, nut, studs, and washers) exposed to air-indoor uncontrolled	Cracking due to SCC; loss of material due to general, pitting, crevice corrosion, wear	AMP XI.M3, "Reactor Head Closure Stud Bolting"	No	Not applicable - BWR only.
3.1.1-092	Steel (including high-strength steel) reactor vessel closure flange assembly components (including flanges, nut, studs, and washers) exposed to air-indoor uncontrolled	Cracking due to SCC, IGSCC; loss of material due to general, pitting, crevice corrosion, wear	AMP XI.M3, "Reactor Head Closure Stud Bolting"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Reactor Head Closure Stud Bolting* (B2.1.3) program implementation.
3.1.1-093	Copper alloy >15% Zn or >8% Al piping, piping components exposed to closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No	Not applicable. ONS has no copper alloy >15% Zn or >8% Al piping or piping components exposed to closed-cycle cooling water or treated water in the Reactor Vessel, Internals, and Reactor Coolant System. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-094	Stainless steel and nickel alloy vessel shell attachment welds exposed to reactor coolant	Cracking due to stress corrosion cracking, IGSCC, cyclic loading	AMP XI.M4, "BWR Vessel ID Attachment Welds," and AMP XI.M2, "Water Chemistry" (stress corrosion cracking, IGSCC mechanisms only)	No	Not applicable - BWR only.
3.1.1-095	Steel (with or without stainless steel or nickel alloy cladding) feedwater nozzles exposed to reactor coolant	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Not applicable - BWR only.
3.1.1-096	Steel (with or without stainless steel cladding) control rod drive return line nozzles and their nozzle-to-vessel welds exposed to reactor coolant in BWR-3, BWR-4, BWR-5, and BWR-6 designs	Cracking due to stress corrosion cracking, IGSCC, cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Not applicable - BWR only.
3.1.1-097	Stainless steel and nickel alloy piping, piping components greater than or equal to 4 NPS; nozzle safe ends and associated welds; control rod drive return line nozzle cap and associated cap-to-nozzle weld or cap-to-safe end weld in BWR-3, BWR 4, BWR 5, and BWR-6 designs	Cracking due to stress corrosion cracking, IGSCC	AMP XI.M7, "BWR Stress Corrosion Cracking," and AMP XI.M2, "Water Chemistry"	No	Not applicable - BWR only.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-098	Stainless steel, nickel alloy penetrations: instrumentation and standby liquid control exposed to reactor coolant	Cracking due to stress corrosion cracking, IGSCC, cyclic loading	AMP XI.M8, "BWR Penetrations," and AMP XI.M2, "Water Chemistry" (stress corrosion cracking, IGSCC mechanisms only)	No	Not applicable - BWR only.
3.1.1-099	Stainless steel (including cast austenitic stainless steel; PH martensitic stainless steel; martensitic stainless steel); nickel alloy (including X-750 alloy) reactor internal components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to thermal aging, neutron irradiation embrittlement	AMP XI.M9, "BWR Vessel Internals"	Yes (SRP-SLR Section 3.1.2.2.13)	Not applicable - BWR only.
3.1.1-100	Stainless steel reactor vessel internals components (jet pump wedge surface) exposed to reactor coolant	Loss of material due to wear	AMP XI.M9, "BWR Vessel Internals"	Yes (SRP-SLR Section 3.1.2.2.13)	Not applicable - BWR only.
3.1.1-101	Stainless steel steam dryers exposed to reactor coolant	Cracking due to flow induced vibration, stress corrosion cracking, IGSCC; loss of material due to wear	AMP XI.M9, "BWR Vessel Internals"	No	Not applicable - BWR only

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-102	Stainless steel fuel supports and control rod drive assemblies control rod drive housing exposed to reactor coolant	Cracking due to stress corrosion cracking, IGSCC	AMP XI.M9, “BWR Vessel Internals,” and AMP XI.M2, “Water Chemistry”	No	Not applicable - BWR only
3.1.1-103	Stainless steel, nickel alloy reactor internal components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, IGSCC, IASCC	AMP XI.M9, “BWR Vessel Internals,” and AMP XI.M2, “Water Chemistry”	Yes (SRP-SLR Section 3.1.2.2.12)	Not applicable - BWR only.
3.1.1-104	Nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Cracking due to IGSCC	AMP XI.M9, “BWR Vessel Internals,” and AMP XI.M2, “Water Chemistry”	No	Not applicable - BWR only
3.1.1-105	Steel piping, piping components exposed to concrete	None	None	Yes (SRP-SLR Section 3.1.2.2.15)	Not applicable. ONS has no stainless steel piping, piping components exposed to concrete in the Reactor Vessel, Internals, and Reactor Coolant System. The associated NUREG-2191 aging items are not used.
3.1.1-106	Nickel alloy piping, piping components exposed to air with borated water leakage	None	None	No	Consistent with NUREG-2191.
3.1.1-107	Stainless steel piping, piping components exposed to gas, air with borated water leakage	None	None	No	Consistent with NUREG-2191.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-110	Metallic piping, piping components exposed to reactor coolant	Wall thinning due to erosion	AMP XI.M17, "Flow Accelerated Corrosion"	No	Not applicable - BWR only.
3.1.1-111	Nickel alloy steam generator tubes exposed to secondary feedwater or steam	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M19, "Steam Generators"	No	Consistent with NUREG-2191.
3.1.1-113	Steel reactor vessel external attachments exposed to indoor, uncontrolled air	Loss of material due to general, pitting, crevice corrosion, wear	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Not applicable - BWR only.
3.1.1-114	Reactor coolant system components defined as ASME Section XI Code Class components (ASME Code Class 1 reactor coolant pressure boundary components, reactor vessel interior attachments, or core support structure components, or ASME Class 2 or 3 components - including ASME defined appurtenances, component supports, and associated pressure boundary welds, or components subject to plant-specific equivalent classifications for these ASME code classes)	Cracking due to stress corrosion cracking, IGSCC, PWSCC, IASCC (stress corrosion cracking stainless steel, nickel alloy components only), fatigue or cyclic loading; loss of material due to general corrosion (steel only), pitting corrosion, crevice corrosion, or wear	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry" (water chemistry-related or corrosion-related aging effect mechanisms only)	No	Not applicable. Cracking and loss of material of reactor coolant system components defined as ASME Section XI Code Class components (ASME Code Class 1 reactor coolant pressure boundary components or core support structure components, or ASME Class 2 or 3 components - including ASME defined appurtenances, component supports, and associated pressure boundary welds, or components subject to plant-specific equivalent classifications for these ASME code classes) is addressed in rows 3.1.1-020, 3.1.1-033, 3.3.1-037, 3.1.1-039, 3.1.1-042, 3.1.1-088, and 3.1.1-116. The associated NUREG-2191 aging items are not used.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-115	Stainless steel piping, piping components exposed to concrete	None	None	Yes (SRP-SLR Section 3.1.2.2.15)	Not applicable. ONS has no stainless steel piping, piping components exposed to concrete in the Reactor Vessel, Internals, and Reactor Coolant System. The associated NUREG-2191 aging items are not used.
3.1.1-116	Nickel alloy control rod drive penetration nozzles exposed to reactor coolant	Loss of material due to wear	Plant-specific aging management program	Yes (SRP-SLR Section 3.1.2.2.10.1)	Not applicable. B&W reactors have a different configuration that utilize a leadscrew support tube, leadscrew support nut, leadscrew support nut lock washer. The associated NUREG-2191 aging items are not used.
3.1.1-117	Stainless steel, nickel alloy control rod drive penetration nozzle thermal sleeves exposed to reactor coolant	Loss of material due to wear	Plant-specific aging management program	Yes (SRP-SLR Section 3.1.2.2.10.2)	Not applicable. B&W reactors have a different configuration that utilize a leadscrew support tube, leadscrew support nut, leadscrew support nut lock washer. The associated NUREG-2191 aging items are not used.
3.1.1-118	Stainless steel, nickel alloy PWR reactor vessel internal components exposed to reactor coolant, neutron flux	Cracking due to stress corrosion cracking, IASCC, cyclic loading, fatigue	Plant-specific aging management program or AMP XI.M16A, “PWR Vessel Internals,” and AMP XI.M2, “Water Chemistry” (SCC and IASCC only), with adjusted site-specific or component-specific aging management basis for a given component	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. Cracking of stainless steel and nickel alloy PWR reactor vessel internal components exposed to reactor coolant and neutron flux is addressed by items 3.1.1-051a and 3.1.1-051b. The associated NUREG-2191 aging items are not used. See further evaluation in Section 3.1.2.2.9.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-119	Stainless steel, nickel alloy, stellite PWR reactor vessel internal components or LRA/ SLRA specified reactor vessel internal component exposed to reactor coolant, neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement or thermal aging embrittlement; changes in dimensions due to void swelling or distortion; loss of preload due to thermal and irradiation-enhanced stress relaxation or creep; loss of material due to wear	Plant-specific aging management program or AMP XI.M16A, "PWR Vessel Internals," with adjusted site-specific or component-specific aging management basis for a given component	Yes (SRP-SLR Section 3.1.2.2.9)	Not applicable. Loss of fracture toughness, changes in dimensions, loss of preload, and loss of material of stainless steel and nickel alloy PWR reactor vessel internal components exposed to reactor coolant and neutron flux are addressed by items 3.1.1-058a and 3.1.1-058b. The associated NUREG-2191 aging items are not used. See further evaluation in Section 3.1.2.2.9.
3.1.1-120	Stainless steel core plate rim holddown bolts exposed to reactor coolant and neutron flux	Loss of preload due to thermal or irradiation-enhanced stress relaxation	AMP XI.M9, "BWR Vessel Internals," and TLAA SRP-SLR 4.7 Other Plant-Specific TLAAs [if an analysis is performed as part of the aging management basis and conforms to the definition of a TLAA in 10 CFR 54.3(a)]	Yes (SRP-SLR Section 3.1.2.2.14)	Not applicable - BWR only.
3.1.1-121	Stainless steel jet pump assembly holddown beam bolts exposed to reactor coolant and neutron flux	Loss of preload due to thermal or irradiation-enhanced stress relaxation	AMP XI.M9, "BWR Vessel Internals"	No	Not applicable - BWR only.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-124	Steel piping, piping components exposed to air-indoor uncontrolled, air-outdoor, condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-2191.
3.1.1-125	Nickel alloy steam generator tubes at support plate locations exposed to secondary feedwater or steam	Cracking due to flow-induced vibration, high-cycle fatigue	AMP XI.M19, “Steam Generators”	No	Consistent with NUREG-2191.
3.1.1-127	Steel (with stainless steel or nickel alloy cladding) steam generator heads and tubesheets exposed to reactor coolant	Loss of material due to boric acid corrosion	AMP XI.M2, “Water Chemistry,” and AMP XI.M19, “Steam Generators”	No	Consistent with NUREG-2191.
3.1.1-128	Stainless steel, nickel alloy nozzles safe ends and welds: high pressure core spray; low pressure core spray; recirculating water, low pressure coolant injection or RHR injection mode exposed to reactor coolant	Cracking due to stress corrosion cracking, IGSCC	AMP XI.M7, “BWR Stress Corrosion Cracking,” and AMP XI.M2, “Water Chemistry”	No	Not applicable - BWR only.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-129	Steel and stainless steel piping, piping components exposed to reactor coolant: welded connections between the re-routed control rod drive return line and the inlet piping system that delivers return line flow to the reactor pressure vessel exposed to reactor coolant	Cracking due to cyclic loading	AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD”	No	Not applicable - BWR only.
3.1.1-133	Steel components exposed to treated water	Long-term loss of material due to general corrosion	AMP XI.M32, “One-Time Inspection”	No	Not applicable - BWR only.
3.1.1-134	Non-metallic thermal insulation exposed to air, condensation	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-2191.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-136	Stainless steel, nickel alloy piping, piping components exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.1.2.2.16)	Consistent with NUREG-2191. Loss of material of stainless steel and nickel alloy components exposed to air is managed by the *One-Time Inspection* (B2.1.20) program. See further evaluation in Section 3.1.2.2.16.
3.1.1-137	Copper alloy piping, piping components exposed to air, condensation, gas	None	None	No	Not applicable. ONS has no in-scope copper alloy piping, piping components exposed to air, condensation, gas in the Reactor Vessel, Internals, and Reactor Coolant System. The associated NUREG-2191 aging items are not used.
3.1.1-139	Stainless steel, nickel alloy reactor vessel top head enclosure flange leakage detection line exposed to air-indoor uncontrolled, reactor coolant leakage	Cracking due to stress corrosion cracking	AMP XI.M32, "One-Time Inspection," or AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes (SRP-SLR Section 3.1.2.2.6.3)	Consistent with NUREG-2191 for the remaining leakage detection line, with exceptions. The vessel flange leak detection lines have been cut and capped on all three units. Cracking of the remaining stainless steel reactor vessel top head enclosure flange leakage detection line exposed to air-indoor uncontrolled is managed by the *One-Time Inspection* (B2.1.20) program. See further evaluation in Section 3.1.2.2.6.3.

Results Tables: Reactor Vessel, Internals, and Reactor Coolant System AMR Results.

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Beltline Welds	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
			Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A
Bottom Head	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.RP-379	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-379	3.1.1- 048	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bottom Head	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
	Structural Support	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.RP-379	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-379	3.1.1- 048	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bottom Head	Structural Support	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Closure Head Dome and Flange	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.RP-379	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-379	3.1.1- 048	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.R-87	3.1.1- 037	A
					Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Closure Head Dome and Flange	Structural Support	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.RP-379	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-379	3.1.1- 048	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.R-87	3.1.1- 037	A
					Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Closure Head Lifting Lugs	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.A2.R-70	3.1.1- 004	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Closure Head Lifting Lugs	Structural Support	Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.A2.R-70	3.1.1- 004	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
Closure Head Stud Assembly	Pressure Boundary	High-Strength Steel	Air – Indoor Uncontrolled (External)	Cracking	Reactor Head Closure Stud Bolting (B2.1.3)	IV.A2.RP-52	3.1.1- 092	B
				Cumulative Fatigue Damage	TLAA	IV.A2.RP-54	3.1.1- 001	A
				Loss of Material	Reactor Head Closure Stud Bolting (B2.1.3)	IV.A2.RP-53	3.1.1- 092	B
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
Control Rod Drive Mechanism Closure Insert and Vent Assemblies	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Control Rod Drive Mechanism Closure Insert and Vent Assemblies	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Control Rod Drive Mechanism Guide Tube Welding to Closure Head	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-186	3.1.1- 045	A
						IV.A2.RP-234	3.1.1- 046	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-186	3.1.1- 045	A
						IV.A2.RP-234	3.1.1- 046	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Control Rod Drive Mechanism Guide Tube Welding to Closure Head	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.A2.RP-186	3.1.1- 045	A
						IV.A2.RP-234	3.1.1- 046	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
	Structural Support	Nickel Alloy	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-186	3.1.1- 045	A
						IV.A2.RP-234	3.1.1- 046	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-186	3.1.1- 045	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Control Rod Drive Mechanism Guide Tube Welding to Closure Head	Structural Support	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-234	3.1.1- 046	A
					Water Chemistry (B2.1.2)	IV.A2.RP-186	3.1.1- 045	A
						IV.A2.RP-234	3.1.1- 046	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Control Rod Drive Mechanism Head Penetration Flange Bolting	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A
				Loss of Material	Bolting Integrity (B2.1.9)	IV.C2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.C2.R-12	3.1.1- 066	A
Control Rod Drive Mechanism Motor Tube Assembly	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Control Rod Drive Mechanism Motor Tube Assembly	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Control Rod Drive Mechanism Nozzle Adaptor Flange	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
	Structural Support	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Control Rod Drive Mechanism Nozzle Adaptor Flange	Structural Support	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Control Rod Drive Mechanism Nozzle Body	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-186	3.1.1- 045	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Control Rod Drive Mechanism Nozzle Body	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-186	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.A2.RP-186	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Control Rod Drive Mechanism Nozzle Body to Nozzle Adaptor Flange Weld	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-186	3.1.1- 045	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Control Rod Drive Mechanism Nozzle Body to Nozzle Adaptor Flange Weld	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-186	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.A2.RP-186	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
	Structural Support	Nickel Alloy	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-186	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-186	3.1.1- 045	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Control Rod Drive Mechanism Nozzle Body to Nozzle Adaptor Flange Weld	Structural Support	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.A2.RP-186	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Core Flood Nozzle Flow Restrictors	Flow Restriction	Stainless Steel	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-234	3.1.1- 046	A
					Water Chemistry (B2.1.2)	IV.A2.RP-234	3.1.1- 046	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
	Pressure Boundary	Stainless Steel	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-234	3.1.1- 046	A
					Water Chemistry (B2.1.2)	IV.A2.RP-234	3.1.1- 046	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Core Flood Nozzle Safe Ends	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Core Flood Nozzle Safe Ends	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-234	3.1.1- 046	A
					Water Chemistry (B2.1.2)	IV.A2.RP-234	3.1.1- 046	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Core Flood Nozzle Thermal Sleeve	Thermal Resistance	Stainless Steel	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Core Flood Nozzle Weld	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Core Flood Nozzle Weld	Pressure Boundary	Nickel Alloy	Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-234	3.1.1- 046	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-234	3.1.1- 046	A
					Water Chemistry (B2.1.2)	IV.A2.RP-234	3.1.1- 046	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Core Flood Nozzles	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Core Flood Nozzles	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Core Guide Lugs	Structural Support	Nickel Alloy	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-57	3.1.1- 040a	A
					Water Chemistry (B2.1.2)	IV.A2.RP-57	3.1.1- 040a	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Head Vent Pipe	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.R-90	3.1.1- 045	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Head Vent Pipe	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.R-90	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.A2.R-90	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Incore Monitoring System Lines	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Code Class 1 Small-Bore Piping (B2.1.22)	IV.C2.RP-235	3.1.1- 039	A
					ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.RP-235	3.1.1- 039	A
					Water Chemistry (B2.1.2)	IV.C2.RP-235	3.1.1- 039	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Incore Monitoring System Lines	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Inlet and Outlet Nozzles	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
			Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A
Instrument Tubes (bottom head)	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Instrument Tubes (bottom head)	Pressure Boundary	Nickel Alloy	Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-59	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.A2.RP-59	3.1.1- 045	A
					TLAA	None	None	H
					Water Chemistry (B2.1.2)	IV.A2.RP-59	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Lower Nozzle Belt Forging	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	A
					TLAA	IV.A2.R-85	3.1.1- 018	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Lower Nozzle Belt Forging	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
			Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A
Lower Shell Plate	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					TLAA	IV.A2.R-85	3.1.1- 018	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Lower Shell Plate	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A
		Steel with Nickel Alloy Cladding	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					TLAA	IV.A2.R-85	3.1.1- 018	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
			Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Lower Shell Plate	Structural Support	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					TLAA	IV.A2.R-85	3.1.1- 018	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
			Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A
		Steel with Nickel Alloy Cladding	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Lower Shell Plate	Structural Support	Steel with Nickel Alloy Cladding	Reactor Coolant (Internal)	Cracking	TLAA	IV.A2.R-85	3.1.1- 018	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
			Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A
Support Skirt	Structural Support	Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.A2.R-70	3.1.1- 004	A
				Loss of Material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	None	None	J
				None	None	None	None	J, 1
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
Transition Forging	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Transition Forging	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					TLAA	IV.A2.R-85	3.1.1- 018	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
			Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A
	Structural Support	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					TLAA	IV.A2.R-85	3.1.1- 018	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Transition Forging	Structural Support	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
			Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A
Upper Nozzle Belt Forging	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					TLAA	IV.A2.R-85	3.1.1- 018	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Upper Nozzle Belt Forging	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
			Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A
Upper Shell Flange	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					TLAA	IV.A2.R-85	3.1.1- 018	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.R-87	3.1.1- 037	A
					Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Upper Shell Flange	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A
Upper Shell Plate	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2.RP-55	3.1.1- 047	C
					TLAA	IV.A2.R-85	3.1.1- 018	A
					Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1- 047	C
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
			Reactor Coolant and Neutron Flux (Internal)	Loss of Fracture Toughness	Neutron Fluence Monitoring (B3.2)	IV.A2.RP-229	3.1.1- 014	A
					Reactor Vessel Material Surveillance (B2.1.19)	IV.A2.RP-229	3.1.1- 014	B
					TLAA	IV.A2.R-84	3.1.1- 013	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Vessel Flange Leak Detection Line	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	A
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A
Vessel Flange Leak Detection Line Tap Weld	Structural Integrity	Nickel Alloy	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	A
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	One-Time Inspection (B2.1.20)	IV.A2.R-74a	3.1.1- 139	A
				Cumulative Fatigue Damage	TLAA	IV.A2.R-219	3.1.1- 010	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1- 088	A

Table 3.1.2-1 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. The RPV support skirt is the critical location of the RPV support assembly and is not susceptible to irradiation embrittlement based on the NDT evaluation reported. The RPV support intended function will be maintained consistent with the CLB during the SPEO when considering damage due to irradiation.

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Baffle Plates and Formers (including baffle plates and former plates)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Change in Dimension	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246b	3.1.1- 058b	D, 2
						IV.B4.RP-247b	3.1.1- 058a	D, 2
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-249	3.1.1- 058a	B
						IV.B4.RP-250	3.1.1- 058b	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
				Reduction in Fracture Toughness	TLAA	IV.B4.RP-376	3.1.1- 015	A
Baffle/Former Bolts and Screws (including dowels, baffle-to-former bolts, locking pins, baffle-to-former shoulder screws, locking dowel, baffle-to-baffle bolts, locking rings, and barrel-to-former cap screws)	Core Support	Nickel Alloy	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	None	None	F

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Baffle/Former Bolts and Screws (including dowels, baffle-to-former bolts, locking pins, baffle-to-former shoulder screws, locking dowel, baffle-to-baffle bolts, locking rings, and barrel-to-former cap screws)	Core Support	Nickel Alloy	Reactor Coolant and Neutron Flux (External)	Cracking	Water Chemistry (B2.1.2)	None	None	F
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	None	None	F
				Loss of Material	PWR Vessel Internals (B2.1.7)	None	None	F
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
				Loss of Preload	PWR Vessel Internals (B2.1.7)	None	None	F
		Stainless Steel	Reactor Coolant and Neutron Flux (External)	Change in Dimension	PWR Vessel Internals (B2.1.7)	IV.B4.RP-256b	3.1.1- 058a	D, 2
				Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-241	3.1.1- 051a	B
						IV.B4.RP-241a	3.1.1- 051a	B

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Baffle/Former Bolts and Screws (including dowels, baffle-to-former bolts, locking pins, baffle-to-former shoulder screws, locking dowel, baffle-to-baffle bolts, locking rings, and barrel-to-former cap screws)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-244	3.1.1- 051b	B
					Water Chemistry (B2.1.2)	IV.B4.RP-241	3.1.1- 051a	A
						IV.B4.RP-241a	3.1.1- 051a	A
						IV.B4.RP-244	3.1.1- 051b	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-240	3.1.1- 058a	B
						IV.B4.RP-240a	3.1.1- 058a	B
						IV.B4.RP-243	3.1.1- 058b	B
						IV.B4.RP-243a	3.1.1- 058b	B
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-240	3.1.1- 058a	B

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Baffle/Former Bolts and Screws (including dowels, baffle-to-former bolts, locking pins, baffle-to-former shoulder screws, locking dowel, baffle-to-baffle bolts, locking rings, and barrel-to-former cap screws)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-243	3.1.1- 058b	B
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
				Loss of Preload	PWR Vessel Internals (B2.1.7)	IV.B4.RP-240	3.1.1- 058a	B
						IV.B4.RP-243	3.1.1- 058b	B
Bottom Flange-to-Upper Grid Screws	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Clamping Ring	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Control Rod Guide Tube Flange-to-Upper Grid Screws (includes flange-to-upper grid bolts and dowel)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Control Rod Guide Tube Pipe and Flange (includes pipe and flange)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Control Rod Guide Tube Rod Guide Sectors	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Control Rod Guide Tube Rod Guide Tubes	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Control Rod Guide Tube Spacer Casting	Core Support	Cast Austenitic Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-242a	3.1.1- 051a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-242a	3.1.1- 051a	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-242	3.1.1- 058a	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
Control Rod Guide Tube Spacer Screws (includes spacer casting screws and spacer casting washers)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Core Barrel Cylinder (including core barrel cylinders, top flange, and bottom flange)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-241a	3.1.1- 051a	D
					Water Chemistry (B2.1.2)	IV.B4.RP-241a	3.1.1- 051a	C
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-249	3.1.1- 058a	D, 1
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
Core Barrel-to-Thermal Shield Bolts (including thermal shield-to-core barrel bolts, thermal shield-to-core barrel bolts locking clips, and thermal shield cap screws)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Change in Dimension	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246e	3.1.1- 058b	B
						IV.B4.RP-248b	3.1.1- 058a	B
				Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246c	3.1.1- 051b	B

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Core Barrel-to-Thermal Shield Bolts (including thermal shield-to-core barrel bolts, thermal shield-to-core barrel bolts locking clips, and thermal shield cap screws)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246d	3.1.1- 051b	B
						IV.B4.RP-248	3.1.1- 051a	B
						IV.B4.RP-248a	3.1.1- 051a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-246c	3.1.1- 051b	A
						IV.B4.RP-248	3.1.1- 051a	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246e	3.1.1- 058b	B
						IV.B4.RP-248b	3.1.1- 058a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Core Support Shield Cylinder (includes cylinder, top flange, bottom flange, flow deflectors, round bars, and lifting lugs)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-251	3.1.1- 058a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
				Reduction in Fracture Toughness	TLAA	IV.B4.RP-376	3.1.1- 015	A
Core Support Shield-to-Core Barrel Bolts (includes core support shield-to-core barrel bolts and core support shield-to-core barrel bolts locking cups and tie plates)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Change in Dimension	PWR Vessel Internals (B2.1.7)	IV.B4.RP-248b	3.1.1- 058a	B
				Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-248	3.1.1- 051a	B
						IV.B4.RP-248a	3.1.1- 051a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-248	3.1.1- 051a	A

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Core Support Shield-to-Core Barrel Bolts (includes core support shield-to-core barrel bolts and core support shield-to-core barrel bolts locking cups and tie plates)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-248b	3.1.1- 058a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
				Reduction in Fracture Toughness	TLAA	IV.B4.RP-376	3.1.1- 015	A
Flow Distributor Head and Flange (including head, flange, and dowels)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Fuel Assembly Support Pads (lower grid assembly) (including fuel assembly support pads, dowels, and cap screws)	Core Support	Nickel Alloy	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-260a	3.1.1- 051b	B

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Fuel Assembly Support Pads (lower grid assembly) (including fuel assembly support pads, dowels, and cap screws)	Core Support	Nickel Alloy	Reactor Coolant and Neutron Flux (External)	Cracking	Water Chemistry (B2.1.2)	IV.B4.RP-260a	3.1.1- 051b	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-260	3.1.1- 058b	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
		Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-260a	3.1.1- 051b	B
						IV.B4.RP-262	3.1.1- 051b	B
					Water Chemistry (B2.1.2)	IV.B4.RP-260a	3.1.1- 051b	A
						IV.B4.RP-262	3.1.1- 051b	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-260	3.1.1- 058b	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Fuel Assembly Support Pads (upper grid assembly) (includes fuel assembly support pads, dowels, and cap screws)	Core Support	Nickel Alloy	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-352	3.1.1- 051b	B
					Water Chemistry (B2.1.2)	IV.B4.RP-352	3.1.1- 051b	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
		Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
Guide Blocks and Bolts (including guide blocks, guide block bolts, guide block washers, and dowels)	Core Support	Nickel Alloy	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-261	3.1.1- 051a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-261	3.1.1- 051a	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Guide Blocks and Bolts (including guide blocks, guide block bolts, guide block washers, and dowels)	Core Support	Nickel Alloy	Reactor Coolant and Neutron Flux (External)	Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-260	3.1.1- 058b	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
		Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246	3.1.1- 051b	B
					Water Chemistry (B2.1.2)	IV.B4.RP-246	3.1.1- 051b	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-260	3.1.1- 058b	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
Incore Guide Support Plate	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Incore Guide Tube Components (including IMI guide tubes, gussets, guide tube nuts, guide tube washers, and locking clips)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Incore Guide Tube Components (including IMI guide tubes, gussets, guide tube nuts, guide tube washers, and locking clips)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-259	3.1.1- 058a	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
Incore Guide Tube Spider Castings	Core Support	Cast Austenitic Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-258	3.1.1- 058a	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
Lower Grid and Shell Forgings (including lower grid forging and lower shell forging)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Lower Grid Flow Distributor Plate	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Lower Grid Rib Section	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Change in Dimension	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246b	3.1.1- 058b	D
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Lower Grid Rib Section	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-249	3.1.1- 058a	D, 1
						IV.B4.RP-259	3.1.1- 058a	B
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246b	3.1.1- 058b	D
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
Lower Grid Rib-to-Shell Forging Screws (including rib-to-shell forging cap screws, and rib-to-shell forging cap screw locking pins)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Lower Internals Assembly-to-Core Barrel Bolts (including lower grid assembly-to-core barrel bolts and lower grid assembly-to-core barrel bolts locking cups)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Change in Dimension	PWR Vessel Internals (B2.1.7)	IV.B4.RP-247b	3.1.1- 058a	B
				Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-247	3.1.1- 051a	B
						IV.B4.RP-247a	3.1.1- 051a	B

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Lower Internals Assembly-to-Core Barrel Bolts (including lower grid assembly-to-core barrel bolts and lower grid assembly-to-core barrel bolts locking cups)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cracking	Water Chemistry (B2.1.2)	IV.B4.RP-247	3.1.1- 051a	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-260	3.1.1- 058b	D
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-247b	3.1.1- 058a	B
						IV.B4.RP-247c	3.1.1- 058a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
				Loss of Preload	PWR Vessel Internals (B2.1.7)	IV.B4.RP-247c	3.1.1- 058a	B

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Lower Internals Assembly-to-Thermal Shield Bolts (includes lower grid assembly-to-thermal shield studs/nuts and lower grid assembly-to-thermal shield bolts/studs/nuts/ locking cups and tie plates)	Core Support	Nickel Alloy	Reactor Coolant and Neutron Flux (External)	Change in Dimension	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246b	3.1.1- 058b	B
				Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246	3.1.1- 051b	B
						IV.B4.RP-246a	3.1.1- 051b	B
					Water Chemistry (B2.1.2)	IV.B4.RP-246	3.1.1- 051b	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-260	3.1.1- 058b	B
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246b	3.1.1- 058b	B
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
		Stainless Steel	Reactor Coolant and Neutron Flux (External)	Change in Dimension	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246b	3.1.1- 058b	B

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Lower Internals Assembly-to-Thermal Shield Bolts (includes lower grid assembly-to-thermal shield studs/nuts and lower grid assembly-to-thermal shield bolts/studs/nuts/ locking cups and tie plates)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246	3.1.1- 051b	B
						IV.B4.RP-246a	3.1.1- 051b	B
					Water Chemistry (B2.1.2)	IV.B4.RP-246	3.1.1- 051b	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-260	3.1.1- 058b	B
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-246b	3.1.1- 058b	B
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
Orifice Plugs	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Outlet and Vent Valve Nozzles	Core Support	Nickel Alloy	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Plenum Cover Assembly (includes weldment ribs, bottom flange, support flange, support ring, cover plate, lifting lugs, base blocks, lifting lug-to-base block bolts, and locking clips)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-251a	3.1.1- 058a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
				Loss of Preload	PWR Vessel Internals (B2.1.7)	IV.B4.RP-251a	3.1.1- 058a	B
				Reduction in Fracture Toughness	TLAA	IV.B4.RP-376	3.1.1- 015	A
Plenum Cylinder	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Plenum Rib Pads	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-251a	3.1.1- 058a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Plenum Rib Pads	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Loss of Preload	PWR Vessel Internals (B2.1.7)	IV.B4.RP-251a	3.1.1- 058a	B
Reinforcing Plates	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Rib-to-Ring Screws (includes rib-to-ring cap screws and locking pins)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Shell Forging-to-Flow Distributor Bolts (includes flow distributor-to-shell forging bolts and flow distributor-to-shell forging bolts locking clip)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Change in Dimension	PWR Vessel Internals (B2.1.7)	IV.B4.RP-256b	3.1.1- 058a	B
				Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-256	3.1.1- 051a	B
						IV.B4.RP-256a	3.1.1- 051a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-256	3.1.1- 051a	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-256b	3.1.1- 058a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Shock Pads and Bolts (including shock pads and shock pad bolts)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Support Post Pipes (including support post pipes, bolting plugs, and support post cap screws)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Surveillance Specimen Holder Bolts (including surveillance specimen holder tube-to-thermal shield studs/nuts and surveillance specimen holder tube-to-thermal shield bolts locking cups and tie plates)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Thermal Shield (including thermal shield cylinders, thermal shield restraint "A" and "B" blocks, thermal shield shims, thermal shield restraint hardfacing, thermal shield plugs, and thermal shield dowels)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Top Flange-to-Cover Bolts (includes top flange-to-cover bolts and locking cups)	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Upper Grid Rib Forging	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Upper Grid Rib Section	Core Support	Stainless Steel	Reactor Coolant and Neutron Flux (External)	None	PWR Vessel Internals (B2.1.7)	IV.B4.RP-236	3.1.1- 055a	B
Vent Valve Assembly Locking Devices	Core Support	Nickel Alloy	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	None	None	F
					Water Chemistry (B2.1.2)	None	None	F
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Vent Valve Assembly Locking Devices	Core Support	Nickel Alloy	Reactor Coolant and Neutron Flux (External)	Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	None	None	F
				Loss of Material	PWR Vessel Internals (B2.1.7)	None	None	F
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
		Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cracking	PWR Vessel Internals (B2.1.7)	IV.B4.RP-252c	3.1.1- 051a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-252c	3.1.1- 051a	A
				Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-252b	3.1.1- 058a	B
				Loss of Material	PWR Vessel Internals (B2.1.7)	IV.B4.RP-252b	3.1.1- 058a	B
					Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
Vent Valve Body and Retaining Rings (includes vent valve guide blocks, vent valve body, vent valve retaining rings, and vent valve jack	Core Support	Cast Austenitic Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Vent Valve Body and Retaining Rings (includes vent valve guide blocks, vent valve body, vent valve retaining rings, and vent valve jack	Core Support	Cast Austenitic Stainless Steel	Reactor Coolant and Neutron Flux (External)	Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-252	3.1.1- 058a	B
						IV.B4.RP-252a	3.1.1- 058b	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
		Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-252	3.1.1- 058a	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
	Flow Restriction	Cast Austenitic Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A
				Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-252	3.1.1- 058a	B
						IV.B4.RP-252a	3.1.1- 058b	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A
		Stainless Steel	Reactor Coolant and Neutron Flux (External)	Cumulative Fatigue Damage	TLAA	IV.B4.R-53	3.1.1- 003	A

Table 3.1.2-2 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Vent Valve Body and Retaining Rings (includes vent valve guide blocks, vent valve body, vent valve retaining rings, and vent valve jack	Flow Restriction	Stainless Steel	Reactor Coolant and Neutron Flux (External)	Loss of Fracture Toughness	PWR Vessel Internals (B2.1.7)	IV.B4.RP-252	3.1.1- 058a	B
				Loss of Material	Water Chemistry (B2.1.2)	IV.B4.RP-24	3.1.1- 087	A

Plant Specific Notes:

1. The only component items that were Expansion for 60 years and were changed to Primary for 80 years due to the increase in the severity of the age-related degradation mechanism are the core barrel cylinder (including the center circumferential weld) for IE and the lower grid rib section for IE.
2. The aging effect of loss of material due to wear is not applicable to this component.

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Metal Hose	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	C
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	C
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	V.D1.EP-80	3.2.1- 050	A
					One-Time Inspection (B2.1.20)	V.D1.EP-80	3.2.1- 050	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	C
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C, 1
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	C, 1
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	C
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	V.D1.EP-80	3.2.1- 050	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Metal Hose	Structural Integrity	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.D1.EP-80	3.2.1- 050	A
Insulation (nuclear instrumentation)	Thermal Resistance	Fiberglass	Air – Indoor Uncontrolled (External)	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-450	3.1.1- 134	A
Insulation (pressurizer)	Thermal Resistance	Stainless Steel	Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
Non-Reactor Coolant Pressure Boundary Reactor Coolant Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A
				Loss of Material	Bolting Integrity (B2.1.9)	IV.C2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.C2.R-12	3.1.1- 066	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
		Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A
				Loss of Material	Bolting Integrity (B2.1.9)	IV.C2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.C2.R-12	3.1.1- 066	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.RP-167	3.1.1- 049	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Non-Reactor Coolant Pressure Boundary Reactor Coolant Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	IV.C2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.C2.R-12	3.1.1- 066	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
		Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A
				Loss of Material	Bolting Integrity (B2.1.9)	IV.C2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.C2.R-12	3.1.1- 066	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.RP-167	3.1.1- 049	A
Non-Reactor Coolant Pressure Boundary Reactor Coolant Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	C
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-63	3.2.1- 022	C

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Non-Reactor Coolant Pressure Boundary Reactor Coolant Piping	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	V.C.EP-63	3.2.1- 022	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
		Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	V.A.EP-77	3.2.1- 049	A
					One-Time Inspection (B2.1.20)	V.A.EP-77	3.2.1- 049	A
			Lubricating Oil (Waste Oil) (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.G.AP-116	3.3.1- 250	A, 2
						VII.G.AP-117	3.3.1- 250	A, 2
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	C

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Non-Reactor Coolant Pressure Boundary Reactor Coolant Piping	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	V.F.EP-12	3.2.1- 058	C
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	V.A.EP-76	3.2.1- 050	A
					One-Time Inspection (B2.1.20)	V.A.EP-76	3.2.1- 050	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	C
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C, 1
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	C, 1
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-63	3.2.1- 022	C
					Water Chemistry (B2.1.2)	V.C.EP-63	3.2.1- 022	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Non-Reactor Coolant Pressure Boundary Reactor Coolant Piping	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	V.A.EP-77	3.2.1- 049	A
					One-Time Inspection (B2.1.20)	V.A.EP-77	3.2.1- 049	A
Non-Reactor Coolant Pressure Boundary Valves	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	C
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-63	3.2.1- 022	C
					Water Chemistry (B2.1.2)	V.C.EP-63	3.2.1- 022	C

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Non-Reactor Coolant Pressure Boundary Valves	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
		Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	V.A.EP-77	3.2.1- 049	A
					One-Time Inspection (B2.1.20)	V.A.EP-77	3.2.1- 049	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	C
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C, 1
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	C, 1

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Non-Reactor Coolant Pressure Boundary Valves	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-63	3.2.1- 022	C
					Water Chemistry (B2.1.2)	V.C.EP-63	3.2.1- 022	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	V.A.EP-77	3.2.1- 049	A
					One-Time Inspection (B2.1.20)	V.A.EP-77	3.2.1- 049	A
Pressurizer; Heater Belt Forgings	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	C

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Heater Belt Forgings	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
						IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Heater Bundle Cover Plate	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	C
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
Pressurizer; Heater Bundle Diaphragm Plate	Pressure Boundary	Stainless Steel	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-217	3.1.1- 033	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Heater Bundle Diaphragm Plate	Pressure Boundary	Stainless Steel	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-217	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Heater Bundle Studs and Nuts	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A
				Loss of Material	Bolting Integrity (B2.1.9)	IV.C2.RP-166	3.1.1- 064	A
					External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.C2.R-12	3.1.1- 066	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
Pressurizer; Immersion Heater End Plug	Pressure Boundary	Stainless Steel	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-217	3.1.1- 033	A
						IV.C2.R-58	3.1.1- 040	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Immersion Heater End Plug	Pressure Boundary	Stainless Steel	Reactor Coolant (External)	Cracking	Water Chemistry (B2.1.2)	IV.C2.R-217	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Immersion Heater Sheath	Pressure Boundary	Stainless Steel	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-217	3.1.1- 033	A
						IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-217	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Level Sensing Nozzles	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Level Sensing Nozzles	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
Pressurizer; Lower Head	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
						IV.C2.RP-380	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-380	3.1.1- 048	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Lower Head	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
						IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Manway	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
						IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Manway	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Manway Covers/Insert	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
		Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	C
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
Pressurizer; Manway Studs and Nuts	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	A
				Loss of Material	Bolting Integrity (B2.1.9)	IV.C2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.C2.R-12	3.1.1- 066	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Manway Studs and Nuts	Pressure Boundary	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.RP-167	3.1.1- 049	A
Pressurizer; Pressure Relief Nozzle	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
						IV.C2.RP-380	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-380	3.1.1- 048	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
						IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Pressure Relief Nozzle Weld	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.RP-156	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-156	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.C2.RP-156	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Sampling Nozzle	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Sampling Nozzle	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
						IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Sampling Nozzle and Level Sensing Nozzle Safe Ends	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Sampling Nozzle and Level Sensing Nozzle Safe Ends	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Shell	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
						IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Spray Head	Pressure Boundary	Cast Austenitic Stainless Steel	Reactor Coolant >250°C (>482°F) (External)	Cracking	One-Time Inspection (B2.1.20)	IV.C2.RP-41	3.1.1- 081	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Spray Head	Pressure Boundary	Cast Austenitic Stainless Steel	Reactor Coolant >250°C (>482°F) (External)	Cracking	Water Chemistry (B2.1.2)	IV.C2.RP-41	3.1.1- 081	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
			Reactor Coolant >250°C (>482°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	IV.C2.RP-41	3.1.1- 081	A
					Water Chemistry (B2.1.2)	IV.C2.RP-41	3.1.1- 081	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Spray Line Nozzle	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
						IV.C2.RP-380	3.1.1- 048	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Spray Line Nozzle	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-380	3.1.1- 048	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
						IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Spray Line Nozzle Safe End and Weld	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.RP-156	3.1.1- 045	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Spray Line Nozzle Safe End and Weld	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-156	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.C2.RP-156	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Spray Line Nozzle Thermal Sleeve	Thermal Resistance	Stainless Steel	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Support Plate Assemblies	Structural Support	Steel	Air – Indoor Uncontrolled (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-19	3.1.1- 036	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Support Plate Assemblies	Structural Support	Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	C
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
Pressurizer; Surge Line Nozzle	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
						IV.C2.RP-380	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-380	3.1.1- 048	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
						IV.C2.R-58	3.1.1- 040	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Surge Line Nozzle	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Surge Line Nozzle Safe End	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
						IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Surge Line Nozzle Safe End Weld	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Surge Line Nozzle Safe End Weld	Pressure Boundary	Nickel Alloy	Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.RP-156	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-156	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.C2.RP-156	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Surge Line Nozzle Thermal Sleeve	Thermal Resistance	Stainless Steel	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
						IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Surge Line Nozzle Thermal Sleeve	Thermal Resistance	Stainless Steel	Reactor Coolant (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Thermowell	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.RP-37	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-37	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.C2.RP-37	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Upper Head	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
						IV.C2.RP-380	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-380	3.1.1- 048	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
						IV.C2.R-58	3.1.1- 040	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Pressurizer; Vent Nozzle	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pressurizer; Vent Nozzle	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-25	3.1.1- 042	A
					Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Class 1 Piping, fittings, and branch connections < NPS 4	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Code Class 1 Small-Bore Piping (B2.1.22)	IV.C2.RP-235	3.1.1- 039	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Class 1 Piping, fittings, and branch connections < NPS 4	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-235	3.1.1- 039	A
					Water Chemistry (B2.1.2)	IV.C2.RP-235	3.1.1- 039	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Class 1 Valve Bodies	Pressure Boundary	Cast Austenitic Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant >250°C (>482°F) (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-05	3.1.1- 020	A
						IV.C2.R-09	3.1.1- 033	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Class 1 Valve Bodies	Pressure Boundary	Cast Austenitic Stainless Steel	Reactor Coolant >250°C (>482°F) (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
					Water Chemistry (B2.1.2)	IV.C2.R-05	3.1.1- 020	A
						IV.C2.R-09	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Fracture Toughness	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-08	3.1.1- 038	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-09	3.1.1- 033	A
						IV.C2.R-56	3.1.1- 035	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Class 1 Valve Bodies	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.C2.R-09	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Closure Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	IV.C2.R-11	3.1.1- 062	A
				Cumulative Fatigue Damage	TLAA	IV.C2.RP-44	3.1.1- 011	A
				Loss of Material	Bolting Integrity (B2.1.9)	IV.C2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.C2.R-12	3.1.1- 066	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
		Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.C2.RP-44	3.1.1- 011	A
				Loss of Material	Bolting Integrity (B2.1.9)	IV.C2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.C2.R-12	3.1.1- 066	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.RP-167	3.1.1- 049	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Core Flood Line	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line	Pressure Boundary	Stainless Steel	Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line Nozzle	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
						IV.C2.RP-380	3.1.1- 048	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line Nozzle	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air with Borated Water Leakage (External)	Loss of Material	Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-380	3.1.1- 048	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line Nozzle Weld	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	C

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line Nozzle Weld	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.RP-159	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-159	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.C2.RP-159	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line Safe End	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	C

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Decay Heat Removal Drop Line Safe End	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.RP-159	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-159	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.C2.RP-159	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
Reactor Coolant Pressure Boundary Piping; Flow Meter Assembly	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	C
						IV.C2.RP-159	3.1.1- 045	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Flow Meter Assembly	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-159	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.C2.RP-159	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Flow Meter Assembly	Pressure Boundary	Stainless Steel	Reactor Coolant (External)	Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
		Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
						IV.C2.RP-380	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-380	3.1.1- 048	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Flow Meter Assembly	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Flow Meter Branch Connections	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	C
						IV.C2.RP-159	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-159	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.C2.RP-159	3.1.1- 045	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Flow Meter Branch Connections	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; High Point Vent and Post Accident Sampling Flow Restrictors	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Code Class 1 Small-Bore Piping (B2.1.22)	IV.C2.RP-235	3.1.1- 039	A
					ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-235	3.1.1- 039	A
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-235	3.1.1- 039	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; High Point Vent and Post Accident Sampling Flow Restrictors	Flow Restriction	Stainless Steel	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Code Class 1 Small-Bore Piping (B2.1.22)	IV.C2.RP-235	3.1.1- 039	A
					ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-235	3.1.1- 039	A
						IV.C2.RP-344	3.1.1- 033	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; High Point Vent and Post Accident Sampling Flow Restrictors	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.C2.RP-235	3.1.1- 039	A
						IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; High Pressure Injection System Makeup & Letdown Line Safe Ends	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	C
						IV.C2.RP-159	3.1.1- 045	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; High Pressure Injection System Makeup & Letdown Line Safe Ends	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-159	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.C2.RP-159	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; High Pressure Injection System Makeup & Letdown Line Safe Ends	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; High Pressure Injection System Makeup & Letdown Line Welds	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	C
						IV.C2.RP-159	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-159	3.1.1- 045	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; High Pressure Injection System Makeup & Letdown Line Welds	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.C2.RP-159	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; High Pressure Injection System Makeup & Letdown Line Welds	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; High Pressure Injection System Makeup & Letdown Lines	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; High Pressure Injection Thermal Sleeves	Thermal Resistance	Stainless Steel	Reactor Coolant (External)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Hot Leg	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
						IV.C2.RP-380	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-380	3.1.1- 048	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Hot Leg	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Hot Leg High Point Vent Branch Connection	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	C
						IV.C2.RP-159	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-159	3.1.1- 045	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Hot Leg High Point Vent Branch Connection	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.C2.RP-159	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Hot Leg Instrumentation and RTE Connection	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	C
						IV.C2.RP-159	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-159	3.1.1- 045	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Hot Leg Instrumentation and RTE Connection	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.C2.RP-159	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Hot Leg Surge Line Nozzle	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
						IV.C2.RP-380	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-380	3.1.1- 048	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Hot Leg Surge Line Nozzle	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Hot Leg Surge Line Nozzle Safe End	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Hot Leg Surge Line Nozzle Safe End	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Hot Leg Surge Line Nozzle Weld	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	C
						IV.C2.RP-159	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-159	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.C2.RP-159	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Hot Leg Surge Line Nozzle Weld	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Reactor Coolant Pump Safe End Welds	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	C
						IV.C2.RP-159	3.1.1- 045	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-159	3.1.1- 045	A
					Water Chemistry (B2.1.2)	IV.C2.RP-159	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Reactor Coolant Pump Safe End Welds	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Reactor Coolant Pump Safe Ends	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	C
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Spray Line	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Spray Line	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Surge Line	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Surge Line	Pressure Boundary	Stainless Steel	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Upper and Lower Cold Leg	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1- 049	A
						IV.C2.RP-380	3.1.1- 048	A
					Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-380	3.1.1- 048	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Upper and Lower Cold Leg	Pressure Boundary	Steel (with Stainless Steel Cladding)	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-56	3.1.1- 035	A
						IV.C2.RP-344	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pressure Boundary Piping; Upper and Lower Cold Leg Drain, Instrumentation, and RTE Connections	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-378	3.1.1- 106	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-58	3.1.1- 040	C
						IV.C2.RP-159	3.1.1- 045	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pressure Boundary Piping; Upper and Lower Cold Leg Drain, Instrumentation, and RTE Connections	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Cracking of Nickel Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in RCPB Components (B2.1.5)	IV.C2.RP-159	3.1.1- 045	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pump; Oil Lift Pumps	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	C
			Lubricating Oil (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-138	3.3.1- 100	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C2.AP-138	3.3.1- 100	A
Reactor Coolant Pump; Studs and Nuts	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	IV.C2.R-11	3.1.1- 062	A
				Cumulative Fatigue Damage	TLAA	IV.C2.RP-44	3.1.1- 011	A
				Loss of Material	Bolting Integrity (B2.1.9)	IV.C2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.C2.R-12	3.1.1- 066	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pump; Thermowells	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-09	3.1.1- 033	A
						IV.C2.R-56	3.1.1- 035	A
					Water Chemistry (B2.1.2)	IV.C2.R-09	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Reactor Coolant Pumps; Casings and Covers	Pressure Boundary	Cast Austenitic Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	A
			Reactor Coolant >250°C (>482°F) (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-05	3.1.1- 020	A

Table 3.1.2-3 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Reactor Coolant Pumps; Casings and Covers	Pressure Boundary	Cast Austenitic Stainless Steel	Reactor Coolant >250°C (>482°F) (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-09	3.1.1- 033	A
					Water Chemistry (B2.1.2)	IV.C2.R-05	3.1.1- 020	A
						IV.C2.R-09	3.1.1- 033	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-223	3.1.1- 009	A
				Loss of Fracture Toughness	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) (B2.1.6)	IV.C2.R-52	3.1.1- 050	A, 3
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A

Plant Specific Notes:

1. This component is associated with the Control Rod Drive Venting System. See drawings OSLRD-100A-1.5, -2.5, and -3.5.
2. This line item is associated with components containing lubricating oil wastage.
3. The operating temperature of the RCP covers, or stuffing boxes, is <482F, therefore it is not subject to thermal aging embrittlement.

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Auxiliary Feedwater and Main Feedwater Closure Bolting	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	IV.D2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.D2.RP-46	3.1.1- 067	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
Auxiliary Feedwater Nozzle Flanges	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A
			Treated Water (Internal)	Cracking	One-Time Inspection (B2.1.20)	None	None	A
					Water Chemistry (B2.1.2)	None	None	A
				Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	C
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Auxiliary Feedwater Nozzle Inlet Header	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
			Treated Water (Internal)	Cumulative Fatigue Damage	TLAA	IV.D2.R-33	3.1.1- 005	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.G.SP-74	3.4.1- 014	A
				Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	IV.D2.R-38	3.1.1- 061	A
Auxiliary Feedwater Nozzle Thermal Sleeves	Thermal Resistance	Nickel Alloy	Secondary Feedwater (External)	Cracking	One-Time Inspection (B2.1.20)	IV.D2.R-36	3.1.1- 078	A
					Water Chemistry (B2.1.2)	IV.D2.R-36	3.1.1- 078	A
				Cumulative Fatigue Damage	TLAA	IV.D2.R-46	3.1.1- 002	C
				Loss of Material	One-Time Inspection (B2.1.20)	None	None	F
					Water Chemistry (B2.1.2)	None	None	F

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Baffle Assemblies	Flow Distribution	Steel	Secondary Feedwater (External)	Cumulative Fatigue Damage	TLAA	IV.D2.R-33	3.1.1- 005	A
				Loss of Material	Steam Generators (B2.1.10)	IV.D2.RP-162	3.1.1- 072	A
					Water Chemistry (B2.1.2)	IV.D2.RP-162	3.1.1- 072	A
	Structural Support	Steel	Secondary Feedwater (External)	Cumulative Fatigue Damage	TLAA	IV.D2.R-33	3.1.1- 005	A
				Loss of Material	Steam Generators (B2.1.10)	IV.D2.RP-162	3.1.1- 072	A
					Water Chemistry (B2.1.2)	IV.D2.RP-162	3.1.1- 072	A
Base Support	Structural Support	Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	IV.A2.R-70	3.1.1- 004	C
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	V.E.E-44	3.2.1- 040	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
Main Feedwater Nozzle Inlet Headers	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	V.E.E-44	3.2.1- 040	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Main Feedwater Nozzle Inlet Headers	Pressure Boundary	Steel	Secondary Feedwater (Internal)	Cumulative Fatigue Damage	TLAA	IV.D2.R-33	3.1.1- 005	A
				Loss of Material	One-Time Inspection (B2.1.20)	IV.D2.RP-153	3.1.1- 083	A
					Water Chemistry (B2.1.2)	IV.D2.RP-153	3.1.1- 083	A
				Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	IV.D2.R-38	3.1.1- 061	A
Main Feedwater Nozzle Spray Plates	Pressure Boundary	Nickel Alloy	Secondary Feedwater (External)	Cracking	One-Time Inspection (B2.1.20)	IV.D2.R-36	3.1.1- 078	A
					Water Chemistry (B2.1.2)	IV.D2.R-36	3.1.1- 078	A
				Cumulative Fatigue Damage	TLAA	IV.D2.R-46	3.1.1- 002	C
				Loss of Material	One-Time Inspection (B2.1.20)	None	None	F
					Water Chemistry (B2.1.2)	None	None	F
Main Feedwater Spray Nozzle Flanges	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	IV.C2.R-452a	3.1.1- 136	C
			Air with Borated Water Leakage (External)	None	None	IV.E.RP-05	3.1.1- 107	A

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Main Feedwater Spray Nozzle Flanges	Pressure Boundary	Stainless Steel	Secondary Feedwater (Internal)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.D1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.D1.SP-87	3.4.1- 085	A
Primary Manway and Inspection Opening Bolting	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	IV.D2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.D2.RP-46	3.1.1- 067	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
Primary Manway and Inspection Opening Covers and Backing Plates	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.D2.RP-47	3.1.1- 042	A
					Water Chemistry (B2.1.2)	IV.D2.RP-47	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.D2.R-222	3.1.1- 008	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Primary Manway and Inspection Opening Covers and Backing Plates	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
Primary Nozzles	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.D2.RP-47	3.1.1- 042	A
					Water Chemistry (B2.1.2)	IV.D2.RP-47	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.D2.R-222	3.1.1- 008	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Secondary Manway and Handhole Opening Bolting	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	IV.D2.RP-166	3.1.1- 064	A
				Loss of Preload	Bolting Integrity (B2.1.9)	IV.D2.RP-46	3.1.1- 067	A

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Secondary Manway and Handhole Opening Bolting	Pressure Boundary	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
Secondary Manway and Handhole Opening Covers	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
			Secondary Feedwater (Internal)	Cumulative Fatigue Damage	TLAA	IV.D2.R-33	3.1.1- 005	A
				Loss of Material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.D2.R-31	3.1.1- 044	A
					One-Time Inspection (B2.1.20)	IV.D2.RP-153	3.1.1- 083	A
					Water Chemistry (B2.1.2)	IV.D2.RP-153	3.1.1- 083	A
Secondary Side Nozzles (vent, drain, and instrumentation)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
			Secondary Feedwater (Internal)	Cumulative Fatigue Damage	TLAA	IV.D2.R-33	3.1.1- 005	A

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Secondary Side Nozzles (vent, drain, and instrumentation)	Pressure Boundary	Steel	Secondary Feedwater (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	IV.D2.RP-153	3.1.1- 083	A
					Water Chemistry (B2.1.2)	IV.D2.RP-153	3.1.1- 083	A
Shell Assembly	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
			Secondary Feedwater (Internal)	Cumulative Fatigue Damage	TLAA	IV.D2.R-33	3.1.1- 005	A
				Loss of Material	One-Time Inspection (B2.1.20)	IV.D2.RP-153	3.1.1- 083	A
					Water Chemistry (B2.1.2)	IV.D2.RP-153	3.1.1- 083	A
Steam Outlet Nozzle	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
			Steam (Internal)	Cumulative Fatigue Damage	TLAA	IV.D2.R-33	3.1.1- 005	A

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Steam Outlet Nozzle	Pressure Boundary	Steel	Steam (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	IV.D2.RP-153	3.1.1- 083	A
					Water Chemistry (B2.1.2)	IV.D2.RP-153	3.1.1- 083	A
				Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	IV.D2.R-38	3.1.1- 061	A
Tube Plugs	Pressure Boundary	Nickel Alloy	Reactor Coolant (External)	Cracking	Steam Generators (B2.1.10)	IV.D2.R-40	3.1.1- 070	A
					Water Chemistry (B2.1.2)	IV.D2.R-40	3.1.1- 070	A
				Cumulative Fatigue Damage	TLAA	IV.D2.R-46	3.1.1- 002	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
Tube Support Plate Assembly (spacers, nuts, keys, and wedges)	Structural Support	Steel	Secondary Feedwater (External)	Cumulative Fatigue Damage	TLAA	IV.D2.R-33	3.1.1- 005	A
				Loss of Material	Steam Generators (B2.1.10)	IV.D2.RP-162	3.1.1- 072	A
					Water Chemistry (B2.1.2)	IV.D2.RP-162	3.1.1- 072	A
Tube Support Plate Assembly (support rods)	Structural Support	Stainless Steel	Secondary Feedwater (External)	Cracking	Steam Generators (B2.1.10)	None	None	E

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tube Support Plate Assembly (support rods)	Structural Support	Stainless Steel	Secondary Feedwater (External)	Cracking	Water Chemistry (B2.1.2)	None	None	E
			Treated Water (External)	Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	C
			Treated Water (Internal)	Loss of Material	Steam Generators (B2.1.10)	None	None	J
					Water Chemistry (B2.1.2)	None	None	J
Tube Support Plate Assembly (tube support plates)	Structural Support	Stainless Steel	Secondary Feedwater (External)	Cracking	Steam Generators (B2.1.10)	None	None	E
					Water Chemistry (B2.1.2)	None	None	E
				Cumulative Fatigue Damage	TLAA	IV.C2.R-18	3.1.1- 005	C
			Treated Water (Internal)	Loss of Material	Steam Generators (B2.1.10)	None	None	J
					Water Chemistry (B2.1.2)	None	None	J
Tubes	Heat Transfer	Nickel Alloy	Secondary Feedwater (External)	Reduction of Heat Transfer	Steam Generators (B2.1.10)	IV.D2.R-407	3.1.1- 111	A
					Water Chemistry (B2.1.2)	IV.D2.R-407	3.1.1- 111	A
	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Steam Generators (B2.1.10)	IV.D2.R-44	3.1.1- 070	A

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tubes	Pressure Boundary	Nickel Alloy	Reactor Coolant (Internal)	Cracking	Water Chemistry (B2.1.2)	IV.D2.R-44	3.1.1- 070	A
				Cumulative Fatigue Damage	TLAA	IV.D2.R-46	3.1.1- 002	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
			Secondary Feedwater (External)	Cracking	Steam Generators (B2.1.10)	IV.D2.R-442	3.1.1- 125	A
						IV.D2.R-47	3.1.1- 069	A
					Water Chemistry (B2.1.2)	IV.D2.R-47	3.1.1- 069	A
				Loss of Material	Steam Generators (B2.1.10)	IV.D2.RP-233	3.1.1- 077	A
Tubesheet	Pressure Boundary	Steel	Secondary Feedwater (External)	Loss of Material	Steam Generators (B2.1.10)	IV.D2.RP-162	3.1.1- 072	A
					Water Chemistry (B2.1.2)	IV.D2.RP-162	3.1.1- 072	A
		Steel with Nickel Alloy Cladding	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	IV.C2.R-431	3.1.1- 124	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tubesheet	Pressure Boundary	Steel with Nickel Alloy Cladding	Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.D2.RP-47	3.1.1- 042	A
					Water Chemistry (B2.1.2)	IV.D2.RP-47	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.D2.R-222	3.1.1- 008	C
				Loss of Material	Steam Generators (B2.1.10)	IV.D2.R-440	3.1.1- 127	A
					Water Chemistry (B2.1.2)	IV.D2.R-440	3.1.1- 127	A
Tube-to-Tube Sheet Welds	Structural Support	Nickel Alloy	Reactor Coolant (External)	Cracking	Water Chemistry (B2.1.2)	IV.D2.RP-185	3.1.1- 025	A
			Reactor Coolant (Internal)	Cracking	Steam Generators (B2.1.10)	IV.D2.RP-185	3.1.1- 025	A
				Cumulative Fatigue Damage	TLAA	IV.D2.R-46	3.1.1- 002	A
				Loss of Material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
			Secondary Feedwater (External)	Cracking	Steam Generators (B2.1.10)	IV.D2.R-47	3.1.1- 069	A
					Water Chemistry (B2.1.2)	IV.D2.R-47	3.1.1- 069	A
				Loss of Material	Steam Generators (B2.1.10)	IV.D2.RP-233	3.1.1- 077	A

Table 3.1.2-4 Reactor Vessel, Reactor Internals, and Reactor Coolant System - Steam Generators - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Upper and Lower Heads	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	V.E.E-44	3.2.1- 040	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	IV.D2.R-17	3.1.1- 049	A
			Reactor Coolant (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.D2.RP-47	3.1.1- 042	A
					Water Chemistry (B2.1.2)	IV.D2.RP-47	3.1.1- 042	A
				Cumulative Fatigue Damage	TLAA	IV.D2.R-222	3.1.1- 008	A
				Loss of Material	Steam Generators (B2.1.10)	IV.D2.R-440	3.1.1- 127	A
					Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1- 088	A
						IV.D2.R-440	3.1.1- 127	A

Plant Specific Notes:

1. None.

Tables 3.1.2-1 through 3.1.2-4 Industry Standard Notes:

A. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

B. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-2191 AMP.

C. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

D. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP takes some exceptions to the NUREG-2191 AMP.

E. Consistent with NUREG-2191 item for material, environment, and aging effect, but a different AMP is credited or NUREG-2191 identifies a plant-specific AMP.

F. Material not in NUREG-2191 for this component.

G. Environment not in NUREG-2191 for this component and material.

H. Aging effect not in NUREG-2191 for this component, material and environment combination.

I. Aging effect in NUREG-2191 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-2191.

3.2 AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES

3.2.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.2, Engineered Safety Features, as being subject to aging management review. The systems, or portions of systems, which are addressed in this section are described in the indicated sections.

- Reactor Building Spray (Section 2.3.2.1)
- Core Flood System (Section 2.3.2.2)
- High Pressure Injection System (Section 2.3.2.3)
- Low Pressure Injection System (Section 2.3.2.4)

3.2.2 RESULTS

The following tables summarize the results of the aging management review for Engineered Safety Features Systems.

- Table 3.2.2-1, Engineered Safety Features – Reactor Building Spray System - Aging Management Evaluation
- Table 3.2.2-2, Engineered Safety Features - Core Flood System - Aging Management Evaluation
- Table 3.2.2-3, Engineered Safety Features – High Pressure Injection System - Aging Management Evaluation
- Table 3.2.2-4, Engineered Safety Features – Low Pressure Injection System - Aging Management Evaluation

3.2.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.2.2.1.1 Reactor Building Spray System

Materials

Components in the Reactor Building Spray System are constructed of the following materials:

* Fiberglass
* Glass
* Stainless Steel
* Steel

Environments

Components in the Reactor Building Spray System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Treated Borated Water
* Treated Borated water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Reactor Building Spray System require aging management to address the following aging effects:

* Cracking
* Loss of Material
* Loss of Preload
* Reduced Thermal Insulation Resistance

Aging Management Programs

The aging effects for components in the Reactor Building Spray System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* One-Time Inspection (B2.1.20)
* Water Chemistry (B2.1.2)

3.2.2.1.2 Core Flood System

Materials

Components in the Core Flood System are constructed of the following materials:

* Stainless Steel
* Steel
* Steel (with Stainless Steel Cladding)

Environments

Components in the Core Flood System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Gas
* Treated Borated Water
* Treated Borated water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Core Flood System require aging management to address the following aging effects:

* Cracking
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Core Flood System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)

* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* One-Time Inspection (B2.1.20)
* Water Chemistry (B2.1.2)

3.2.2.1.3 High Pressure Injection System

Materials

Components in the High Pressure Injection System are constructed of the following materials:

* Cast Austenitic Stainless Steel
* Fiberglass
* Glass
* Stainless Steel
* Steel

Environments

Components in the High Pressure Injection System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Gas
* Treated Borated Water
* Treated Borated Water >250°C (>482°F)
* Treated Borated water >60°C (>140°F)

Aging Effects Requiring Management

Components in the High Pressure Injection System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Loss of Fracture Toughness
* Loss of Material

* Loss of Preload
* Reduced Thermal Insulation Resistance
* Wall Thinning

Aging Management Programs

The aging effects for components in the High Pressure Injection System are managed by the following AMPs:

* ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* One-Time Inspection (B2.1.20)
* TLAA
* Water Chemistry (B2.1.2)

3.2.2.1.4 Low Pressure Injection System

Materials

Components in the Low Pressure Injection System are constructed of the following materials:

* Cast Austenitic Stainless Steel
* Fiberglass
* Glass
* Stainless Steel
* Steel
* Steel with Internal Coating/Lining

Environments

Components in the Low Pressure Injection System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Concrete
* Raw Water
* Treated Borated Water
* Treated Borated Water >250°C (>482°F)
* Treated Borated water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Low Pressure Injection System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Flow Blockage

* Long-Term Loss of Material
* Loss of Coating or Lining Integrity
* Loss of Fracture Toughness
* Loss of Material
* Loss of Preload
* Reduced Thermal Insulation Resistance
* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Low Pressure Injection System are managed by the following AMPs:

* ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Outdoor and Large Atmospheric Metallic Storage Tanks (B2.1.17)
* TLAA
* Water Chemistry (B2.1.2)

3.2.2.2 Further Evaluation of Aging Management as Recommended by NUREG-2192

NUREG-2192 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the SLRA. For the engineered safety features, those evaluations are addressed in the following sections. Italicized text is taken directly from NUREG-2192.

3.2.2.2.1 Cumulative Fatigue Damage

NUREG-2192:

Evaluations involving time-dependent fatigue or cyclical loading parameters may be time-limited aging analyses (TLAAs), as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). This TLAA is addressed separately in Section 4.3, "Metal Fatigue," or Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses," of this SRP-SLR. For plant-specific cumulative usage factor calculations that are based on stress-based input methods, the methods are to be appropriately defined and discussed in the applicable TLAAs.

Evaluation:

[3.2.1-001]: Fatigue of Engineered Safety Features components is a TLAA, as defined in 10 CFR 54.3. The evaluation of this TLAA is addressed in SLRA Section 4.3.3, "Non-Class 1 Piping Fatigue Analyses".

3.2.2.2.2 Loss of Material Due to Pitting and Crevice Corrosion in Stainless Steel and Nickel Alloys

NUREG-2192:

Loss of material due to pitting and crevice corrosion could occur in indoor or outdoor stainless steel (SS) and nickel alloy piping, piping components, and tanks exposed to any air, condensation, or underground environment when the component is: (a) uninsulated; (b) insulated; (c) in the vicinity of insulated components; or (d) in the vicinity of potentially transportable halogens. Loss of material due to pitting and crevice corrosion can occur on SS and nickel alloys in environments containing sufficient halides (e.g., chlorides) in the presence of moisture.

Insulated SS and nickel alloy components exposed to air, condensation, or underground environments are susceptible to loss of material due to pitting or crevice corrosion if the insulation contains certain contaminants. Leakage of fluids through mechanical connections such as bolted flanges and valve packing can result in contaminants leaching onto the component surface or the surfaces of other components below the component. For outdoor insulated SS and nickel alloy components, rain and changing weather conditions can result in moisture intrusion into the insulation.

Plant-specific operating experience (OE) and the condition of SS and nickel alloy components are evaluated to determine if prolonged exposure to the plant-specific environments has resulted in pitting or crevice corrosion. Loss of material due to pitting and crevice corrosion is not an aging effect requiring management for SS and nickel alloy components if (a) plant-specific OE does not reveal a history of loss of material due to pitting or crevice corrosion, and (b) a one-time inspection demonstrates that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the subsequent period of extended operation. The applicant documents the results of the plant-specific OE review in the SLRA.

In the environment of air-indoor controlled, pitting and crevice corrosion is only expected to occur as the result of a source of moisture and halides. Inspections focus on the most susceptible locations.

The GALL-SLR Report recommends further evaluation of SS and nickel alloy piping, piping components, and tanks exposed to an air, condensation, or underground environment to determine whether an AMP is needed to manage the aging effect of loss of material due to pitting and crevice corrosion. The GALL-SLR Report AMP XI.M32, "One-Time Inspection," describes an acceptable program to demonstrate that loss of material due to pitting and crevice corrosion is not occurring at a rate that affects the intended function of the components. If loss of material due to pitting or crevice corrosion has occurred and is sufficient to potentially affect the intended function of systems, structures, and components (SSCs), the following AMPs describe acceptable programs to manage loss of material due to pitting or crevice corrosion: (a) the GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," for tanks; (b) the GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," for external surfaces of piping and piping components; (c) the GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," for underground piping, piping components and tanks; and (d) the GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," for internal surfaces of components that are not included in other AMPs. The timing of the one-time or periodic inspections is consistent with that recommended in the AMP selected by the applicant during the development of the SLRA. For example, a one-time inspection would be conducted between the 50th and 60th year of operation, as recommended by the "detection of aging effects" program element in AMP XI.M32.

The applicant may establish that loss of material due to pitting and crevice corrosion is not an aging effect requiring management by demonstrating that a barrier coating isolates the component from aggressive environments. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," describes an acceptable program to manage the integrity of a barrier coating.

Evaluation:

A review of ONS OE confirmed that pitting and crevice corrosion has not occurred on external surfaces of stainless steel piping, piping components, and tanks exposed to air or condensation environments in the ONS engineered safety features systems.

[3.2.1-004]: The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of stainless steel components exposed to air-indoor uncontrolled (external) is not occurring.

[3.2.1-048]: The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of stainless steel components exposed to air-indoor uncontrolled (internal) is not occurring.

[3.2.1-099]: The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of stainless steel tanks exposed to air-indoor uncontrolled environments is not occurring.

[3.2.1-106]: Not applicable. ONS has no stainless steel or nickel alloy tanks in the Engineered Safety Features systems within the scope of the *Outdoor and Large Atmospheric Metallic Storage Tanks* (B2.1.17) program.

[3.2.1-107]: The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion is not occurring in insulated stainless steel piping and piping components exposed to air-indoor uncontrolled environments.

[3.2.1-112]: Not applicable. ONS has no underground stainless steel or nickel alloy components in the scope of subsequent license renewal in Engineered Safety Features systems.

3.2.2.2.3 Loss of Material Due to General Corrosion and Flow Blockage Due to Fouling

NUREG-2192:

Loss of material due to general corrosion (as applicable) and flow blockage due to fouling for all materials can occur in the spray nozzles and flow orifices in the drywell and suppression chamber spray system exposed to air-indoor uncontrolled. This aging effect and mechanism will apply since the carbon steel piping upstream of the spray nozzles and flow orifices is occasionally wetted, even though the majority of the time this system is in standby. The wetting and drying of these components can accelerate corrosion in the system and lead to flow blockage from an accumulation of corrosion products. Aging effects sufficient to result in a loss of intended function are not anticipated if: (a) the applicant identifies those portions of the system that are normally dry but subject to periodic wetting; (b) plant-specific procedures exist to drain the normally dry portions that have been wetted during normal plant operation or inadvertently; (c) the plant-specific configuration of the drains and piping allow sufficient draining to empty the normally dry pipe; (d) plant-specific OE has not revealed loss of material or flow blockage due to *fouling; and (e) a one-time inspection is conducted to verify that loss of material or flow blockage due to fouling has not occurred. The GALL-SLR Report AMP XI.M32, "One-Time Inspection," describes an acceptable program to conduct the one-time inspections. The GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," describes an acceptable program to manage loss of material due to general corrosion and flow blockage due to fouling when the above conditions are not met.*

Evaluation:

Not applicable – BWR only.

3.2.2.2.4 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

NUREG-2192:

Cracking due to stress corrosion cracking (SCC) could occur in indoor or outdoor SS piping, piping components, and tanks exposed to any air, condensation, or underground environment when the component is: (a) uninsulated; (b) insulated; (c) in the vicinity of insulated components, or (d) in the vicinity of potentially transportable halogens. Cracking can occur in environments containing sufficient halides (e.g., chlorides) in the presence of moisture.

Insulated SS components exposed to indoor air, outdoor air, condensation, or underground environments are susceptible to SCC if the insulation contains certain contaminants. Leakage of fluids through bolted connections (e.g., flanges, valve packing) can result in contaminants present in the insulation leaching onto the component surface or the surfaces of other components below the component. For outdoor insulated SS components, rain and changing weather conditions can result in moisture intrusion into the insulation.

Plant-specific OE and the condition of SS components are evaluated to determine if prolonged exposure to the plant-specific environments has resulted in SCC. SCC in SS components is not an aging effect requiring management if (a) plant-specific OE does not reveal a history of SCC and (b) a one-time inspection demonstrates that the aging effect is not occurring.

In the environment of air-indoor controlled, SCC is only expected to occur as the result of a source of moisture and halides. Inspections focus on the most susceptible locations. The applicant documents the results of the plant-specific OE review in the SLRA.

The GALL-SLR Report recommends further evaluation of SS piping, piping components, and tanks exposed to an air, condensation, or underground environment to determine whether an AMP is needed to manage the aging effect of SCC. The GALL-SLR Report AMP XI.M32, "One-Time Inspection," describes an acceptable program to demonstrate that SCC is not occurring. If SCC is applicable, the following AMPs describe acceptable programs to manage loss of material due to SCC: (a) the GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," for tanks; (b) the GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," for external surfaces of piping and piping components; (c) the

GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," for underground piping, piping components and tanks; and (d) the GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," for internal surfaces of components that are not included in other AMPs. The timing of the one-time or periodic inspections is consistent with that recommended in the AMP selected by the applicant during the development of the SLRA. For example, one-time inspections would be conducted between the 50th and 60th year of operation, as recommended by the "detection of aging effects" program element in AMP XI.M32.

The applicant may establish that SCC is not an aging effect requiring management for all components, by demonstrating that a barrier coating isolates the component from aggressive environments. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. The GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," describes an acceptable program to manage the integrity of a barrier coating.

Evaluation:

A review of ONS OE confirmed that stress corrosion cracking has not occurred on external surfaces of stainless steel piping, piping components, and tanks exposed to air or condensation environments in the ONS engineered safety features systems or in reactor vessel, internals, and reactor coolant system components aligned to this section.

[3.2.1-007]: A one-time inspection will be performed to confirm that cracking due to stress corrosion cracking is not occurring on stainless steel piping, piping components, and tanks exposed to any air-indoor uncontrolled (external).

[3.2.1-080]: Not applicable. ONS has no underground stainless steel components in scope of SLR in the engineered safety features systems.

[3.2.1-103]: Not applicable. ONS has no stainless steel tanks in the engineered safety features systems within the scope of the *Outdoor and Large Atmospheric Metallic Storage Tanks* (B2.1.17) program.

[3.2.1-108]: A one-time inspection will be performed to demonstrate that cracking due to stress corrosion cracking is not occurring in insulated stainless steel piping and piping components exposed to air-indoor uncontrolled environments.

3.2.2.2.5 Quality Assurance for Aging Management of Non-Safety Related Components

NUREG-2192:

Acceptance criteria are described in Branch Technical Position (BTP) IQMB-1 (Appendix A.2 of this SRP-SLR).

Evaluation:

Quality Assurance provisions applicable to SLR are discussed in Appendix B1.3, Quality Assurance Program and Administrative Controls.

3.2.2.2.6 Ongoing Review of Operating Experience

NUREG-2192:

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

Evaluation:

The process for the ongoing review of OE is described in Appendix B1.4, Operating Experience.

3.2.2.2.7 Loss of Material Due to Recurring Internal Corrosion

NUREG-2192:

Recurring internal corrosion can result in the need to augment AMPs beyond the recommendations in the GALL-SLR Report. During the search of plant-specific OE conducted during the SLRA development, recurring internal corrosion can be identified by the number of occurrences of aging effects and the extent of degradation at each localized corrosion site. This further evaluation item is applicable if the search of plant-specific OE reveals repetitive occurrences. The criteria for recurrence is (a) a 10-year search of plant-specific OE reveals the aging effect has occurred in three or more refueling outage cycles; or (b) a 5-year search of plant-specific OE reveals the aging effect has occurred in two or more refueling outage cycles and resulted in the component either not meeting plant-specific acceptance criteria or experiencing a reduction in wall thickness greater than 50 percent (regardless of the minimum wall thickness).

The GALL-SLR Report recommends that the GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," be evaluated for inclusion of augmented requirements to ensure the adequate management of any recurring aging effect(s). Alternatively, a plant-specific AMP may be proposed. Potential augmented requirements include: alternative examination methods (e.g., volumetric versus external visual), augmented inspections (e.g., a greater number of locations, additional locations based on risk insights based on susceptibility to aging effect and consequences of failure, a greater frequency of inspections), and additional trending parameters and decision points where increased inspections would be implemented.

The applicant states: (a) why the program's examination methods will be sufficient to detect the recurring aging effect before affecting the ability of a component to perform its intended function, (b) the basis for the adequacy of augmented or lack of augmented inspections, (c) what *parameters will be trended as well as the decision points where increased inspections would be implemented (e.g., the extent of degradation at individual corrosion sites, the rate of degradation change), (d) how inspections of components that are not easily accessed (i.e., buried, underground) will be conducted, and (e) how leaks in any involved buried or underground components will be identified.*

Plant-specific OE examples should be evaluated to determine if the chosen AMP should be augmented even if the thresholds for significance of aging effect or frequency of occurrence of aging effect have not been exceeded. For example, during a 10-year search of plant-specific OE, two instances of a 360 degree 30 percent wall loss occurred at copper alloy to steel joints. Neither the significance of the aging effect nor the frequency of occurrence of aging effect threshold has been exceeded. Nevertheless, the OE should be evaluated to determine if the AMP that is proposed to manage the aging effect is sufficient (e.g., method of inspection, frequency of inspection, number of inspections) to provide reasonable assurance that the current licensing basis (CLB) intended functions of the component will be met throughout the subsequent period of extended operation. While recurring internal corrosion is not as likely in other environments as raw water and waste water (e.g., treated water), the aging effect should be addressed in a similar manner.

Evaluation:

[3.2.1-066]: Not applicable. A review of OE confirms that loss of material due to recurring internal corrosion is not an aging effect that requires management for the engineered safety features systems.

3.2.2.2.8 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

NUREG-2192:

SCC is a form of environmentally assisted cracking which is known to occur in high and moderate strength aluminum alloys. The three conditions necessary for SCC to occur in a component are a sustained tensile stress, aggressive environment, and material with a susceptible microstructure. Cracking due to SCC can be mitigated by eliminating one of the three necessary conditions. For the purposes of subsequent license renewal (SLR), acceptance criteria for this further evaluation are being provided for demonstrating that the specific material is not susceptible to SCC or an aggressive environment is not present. Cracking due to SCC is an aging effect requiring management unless it is demonstrated by the applicant that one of the two necessary conditions discussed below is absent.

Susceptible Material: If the material is not susceptible to SCC, then cracking is not an aging effect requiring management. The microstructure of an aluminum alloy, of which alloy composition is only one factor, is what determines if the alloy is susceptible to SCC. Therefore, determining susceptibility based on alloy composition alone is not adequate to conclude whether a particular material is susceptible to SCC. The temper, condition, and product form of the alloy is considered when assessing if a material is susceptible to SCC. Aluminum alloys that are susceptible to SCC include:

- *2xxx series alloys in the F, W, Ox, T3x, T4x, or T6x temper*
- *5xxx series alloys with a magnesium content of 3.5 weight percent or greater*
- *6xxx series alloys in the F temper*
- *7xxx series alloys in the F, T5x, or T6x temper*
- *2xx.x and 7xx.x series alloys*
- *3xx.x series alloys that contain copper*
- *5xx.x series alloys with a magnesium content of greater than 8 weight percent*

The material is evaluated to verify that it is not susceptible to SCC and that the basis used to make the determination is technically substantiated. Tempers have been specifically developed to improve the SCC resistance for some aluminum alloys. Aluminum alloy and temper combination which are not susceptible to SCC when used in piping, piping component, and tank applications include 1xxx series, 3xxx series, 6061-T6x, and 5454-x. If it is determined that a material is not susceptible to SCC, the SLRA provides the components/locations where it is used, alloy composition, temper or condition, product form, and for tempers not addressed above, the basis used to determine the alloy is not susceptible and technical information substantiating the basis.

<u>Aggressive Environment</u>: If the environment to which an aluminum alloy is exposed is not aggressive, such as dry gas or treated water, then cracking due to SCC will not occur and it is not an aging effect requiring management. Aggressive environments that are known to result in cracking due to SCC of susceptible aluminum alloys are aqueous solutions, air, condensation, and underground locations that contain halides (e.g., chloride). Halide concentrations should be considered high enough to facilitate SCC of aluminum alloys in uncontrolled or untreated aqueous solutions and air, such as raw water, waste water, condensation, underground locations, and outdoor air, unless demonstrated otherwise.

Halides could be present on the surface of the aluminum material if the component is encapsulated in a material such as insulation or concrete. In a controlled or uncontrolled indoor air, condensation, or underground environment, sufficient halide concentrations to cause SCC could be present due to secondary sources such as leakage from nearby components (e.g., leakage from insulated flanged connections or valve packing). If an aluminum component is exposed to a halide-free indoor air environment, not encapsulated in materials containing halides, and the exposure to secondary sources of moisture or halides is precluded, cracking due to SCC is not expected to occur. The plant-specific configuration can be used to demonstrate that exposure to halides will not occur. If it is determined that SCC will not occur because the environment is not aggressive, the SLRA provides the components and locations exposed to the environment, a description of the environment, basis used to determine the environment is not aggressive, and technical information substantiating the basis. The GALL-SLR Report AMP XI.M32, "One-Time Inspection," and a review of plant-specific OE describe an acceptable means to confirm the absence of moisture or halides within the proximity of the aluminum component.

If the environment potentially contains halides, the GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," describes an acceptable program to manage cracking due to SCC of aluminum tanks. The GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," describes an acceptable program to manage cracking *due to SCC of aluminum piping and piping components. The GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," describes an acceptable program to manage cracking due to SCC of aluminum piping and tanks, which are buried or underground. The GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" describes an acceptable program to manage cracking due to SCC of aluminum components that are not included in other AMPs.*

An alternative strategy to demonstrating that an aggressive environment is not present is to isolate the aluminum alloy from the environment using a barrier to prevent SCC. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. The GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," describes an acceptable program to manage the integrity of a barrier coating for internal or external coatings.

Evaluation:

[3.2.1-100]: Not applicable. There are no aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation (internal) raw water, or waste water in the engineered safety features systems at ONS.

[3.2.1-101]: Not applicable. There are no aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation (external) in the engineered safety features systems at ONS.

[3.2.1-102]: Not applicable. There are no aluminum or aluminum alloy tanks exposed to air, condensation, soil, concrete, raw water, or waste water in the engineered safety features systems at ONS.

[3.2.1-109]: Not applicable. There are no insulated aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation in the engineered safety features systems at ONS.

[3.2.1-110]: Not applicable. There are no underground aluminum or aluminum alloy piping, piping components, or tanks in the engineered safety features systems at ONS.

3.2.2.2.9 Loss of Material Due to General, Crevice or Pitting Corrosion and Cracking Due to Stress Corrosion Cracking

NUREG-2192:

Loss of material due to general (steel only), crevice, or pitting corrosion and cracking due to SCC (stainless steel only) can occur in steel and stainless steel piping and piping components exposed to concrete. Concrete provides a high alkalinity environment that can mitigate the effects of loss of material for steel piping, thereby significantly reducing the corrosion rate.

However, if water intrudes through the concrete, the pH can be reduced and ions that promote loss of material such as chlorides, which can penetrate the protective oxide layer created in the high alkalinity environment, can reach the surface of the metal. Carbonation can reduce the pH within concrete. The rate of carbonation is reduced by using concrete with a low water-to-cement ratio and low permeability. Concrete with low permeability also reduces the potential for the penetration of water. Adequate air entrainment improves the ability of the concrete to resist freezing and thawing cycles and therefore reduces the potential for cracking and intrusion of water. Cracking due to SCC, as well as pitting and crevice corrosion can occur due to halides present in the water that penetrates to the surface of the metal.

If the following conditions are met, loss of material is not considered to be an applicable aging effect for steel: (a) attributes of the concrete are consistent with American Concrete Institute (ACI) 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG–1557; (b) plant-specific OE indicates no degradation of the concrete that could lead to penetration of water to the metal surface; and (c) the piping is not potentially exposed to groundwater. For SS components loss of material and cracking due to SCC are not considered to be applicable aging effects as long as the piping is not potentially exposed to groundwater. Where these conditions are not met, loss of material due to general (steel only), crevice or pitting corrosion and cracking due to SCC (SS only) are identified as applicable aging effects. The GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," describes an acceptable program to manage these aging effects.

<u>Evaluation</u>

[3.2.1-055]: Not applicable. There are no steel piping or piping components exposed to concrete in the engineered safety features system at ONS.

[3.2.1-091]: Not applicable. There are no in-scope stainless steel piping or piping components exposed to concrete in the engineered safety features system at ONS.

3.2.2.2.10 Loss of Material Due to Pitting and Crevice Corrosion in Aluminum Alloys

<u>NUREG-2192:</u>

Loss of material due to pitting and crevice corrosion could occur in aluminum piping, piping components, and tanks exposed to an air, condensation, underground, raw water, or waste water environment for a sufficient duration of time. Environments that can result in pitting and/or crevice corrosion of aluminum alloys are those that contain halides (e.g., chloride) in the presence of moisture. The moisture level and halide concentration in atmospheric and uncontrolled air are greatly dependent on geographical location and site-specific conditions. Moisture level and halide concentration should be considered high enough to facilitate pitting and/or crevice corrosion of aluminum alloys in atmospheric and uncontrolled air, unless demonstrated otherwise. The periodic introduction of moisture or halides into an environment from secondary sources should also be considered. Leakage of fluids from mechanical connections (e.g., insulated bolted flanges and valve packing); onto a component in indoor controlled air is an example of a secondary source that should be considered. Halide *concentrations should be considered high enough to facilitate loss of material of aluminum alloys in untreated aqueous solutions, unless demonstrated otherwise. Plant-specific OE and the condition of aluminum alloy components are evaluated to determine if prolonged exposure to the plant-specific air, condensation, underground, or water environments has resulted in pitting or crevice corrosion. Loss of material due to pitting and crevice corrosion is not an aging effect requiring management for aluminum alloys if (a) plant-specific OE does not reveal a history of loss of material due to pitting or crevice corrosion and (b) a one-time inspection demonstrates that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components. The applicant documents the results of the plant-specific OE review in the SLRA.*

In the environment of air-indoor controlled, pitting and crevice corrosion is only expected to occur as the result of a source of moisture and halides. Alloy susceptibility may be considered when reviewing OE and interpreting inspection results. Inspections focus on the most susceptible alloys and locations.

The GALL-SLR Report recommends the further evaluation of aluminum piping, piping components, and tanks exposed to an air, condensation, or underground environment to determine whether an AMP is needed to manage the aging effect of loss of material due to pitting and crevice corrosion. GALL-SLR Report AMP XI.M32, “One-Time Inspection,” describes an acceptable program to demonstrate that the aging effect of loss of material due to pitting and crevice corrosion is not occurring at a rate that will affect the intended function of the components. If loss of material due to pitting or crevice corrosion has occurred and is sufficient to potentially affect the intended function of an SSC, the following AMPs describe acceptable programs to manage loss of material due to pitting and crevice corrosion: (i) the GALL-SLR Report AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” for tanks; (ii) the GALL-SLR Report AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” for external surfaces of piping and piping components; (iii) the GALL-SLR Report AMP XI.M41, “Buried and Underground Piping and Tanks,” for underground piping, piping components and tanks; and (iv) the GALL-SLR Report AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components” for internal surfaces of components that are not included in other AMPs. The timing of the one-time or periodic inspections is consistent with that recommended in the AMP selected by the applicant during the development of the SLRA. For example, one-time inspections would be conducted between the 50th and 60th year of operation, as recommended by the “detection of aging effects” program element in AMP XI.M32.

An alternative strategy to demonstrating that an aggressive environment is not present is to isolate the aluminum alloy from the environment using a barrier to prevent loss of material due to pitting and crevice corrosion. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. The GALL-SLR Report AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks,” or equivalent program, describes an acceptable program to manage the integrity of a barrier coating.

Evaluation:

[3.2.1-042]: Not applicable. There are no aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation (external) in the engineered safety features systems at ONS.

[3.2.1-056]: Not applicable. There are no aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation (internal) in the engineered safety features systems at ONS.

[3.2.1-105]: Not applicable. There are no aluminum or aluminum alloy tanks exposed to air or condensation in the engineered safety features systems at ONS.

[3.2.1-111]: Not applicable. There are no underground aluminum or aluminum alloy piping, piping components, or tanks in the engineered safety features systems at ONS.

[3.2.1-119]: Not applicable. There are no insulated aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation in the engineered safety features systems at ONS.

[3.2.1-121]: Not applicable. There are no aluminum or aluminum alloy piping, piping components, or tanks exposed to raw water or waste water in the engineered safety features systems at ONS.

Results Tables: Engineered Safety Features Systems

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-001	Stainless steel, steel piping, piping components exposed to any environment	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes (SRP-SLR Section 3.2.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of stainless steel piping, piping components is a TLAA. The evaluation of this TLAA is addressed in Section 4.3. See further evaluation in Section 3.2.2.2.1.
3.2.1-004	Stainless steel, nickel alloy piping, piping components exposed to air, condensation (external)	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.2)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that loss of material is not occurring in stainless steel components exposed to air-indoor uncontrolled (external) environments. See further evaluation in Section 3.2.2.2.2.
3.2.1-005	Stainless steel orifice (miniflow recirculation when centrifugal HPSI pumps are used for normal charging) exposed to treated borated water	Loss of material due to erosion	AMP XI.M32, "One-Time Inspection"	No	Consistent with NUREG-2191.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-006	Metallic drywell and suppression chamber spray system (internal surfaces): flow orifice; spray nozzles exposed to air – indoor uncontrolled, condensation	Loss of material due to general, pitting, crevice corrosion; flow blockage due to fouling	AMP XI.M32, "One-Time Inspection," or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes (SRP-SLR Section 3.2.2.2.3)	Not applicable - BWR only
3.2.1-007	Stainless steel piping, piping components, tanks exposed to air, condensation	Cracking due to SCC	AMP XI.M32, "One Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.4)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that cracking is not occurring in stainless steel components exposed to air environments. In addition to Engineered Safety Features systems, components in Reactor Vessel, Internals, and Reactor Coolant System are aligned to this item. See further evaluation in Section 3.2.2.2.4.
3.2.1-008	Copper alloy (>15% Zn) piping, piping components exposed to air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No	Not applicable. ONS has no copper alloy (>15% Zn) piping or piping components exposed to air with borated water leakage in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-009	Steel external surfaces exposed to air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No	Consistent with NUREG-2191.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-010	Cast austenitic stainless steel piping, piping components exposed to treated borated water >250°C (>482°F), treated water >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No	Consistent with NUREG-2191 except that a different program is used. The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* (B2.1.1) will be used to manage loss of fracture toughness due to thermal aging embrittlement of valve bodies.
3.2.1-011	Steel piping, piping components exposed to steam, treated water	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No	Not applicable. ONS has no steel piping or piping components exposed to steam or treated water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-012	High-strength steel closure bolting exposed to air, soil, underground	Cracking due to SCC; cyclic loading	AMP XI.M18, "Bolting Integrity"	No	Not applicable. ONS has no high-strength steel closure bolting exposed to air, soil, or underground in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-014	Stainless steel, steel, nickel alloy closure bolting exposed to air- indoor uncontrolled, air-outdoor, condensation	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, "Bolting Integrity"	No	Consistent with NUREG-2191.
3.2.1-015	Metallic closure bolting exposed to any environment, soil underground	Loss of preload due to thermal effects, gasket creep, self-loosening	AMP XI.M18, "Bolting Integrity"	No	Consistent with NUREG-2191.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-016	Steel piping, piping components exposed to treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. ONS has no steel piping or piping components exposed to treated water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-017	Aluminum piping, piping components exposed to treated water, treated borated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. ONS has no aluminum piping or piping components exposed to treated water or treated borated water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-019	Stainless steel heat exchanger tubes exposed to treated water, treated borated water	Reduction of heat transfer due to fouling	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191.
3.2.1-020	Stainless steel, steel (with stainless steel or nickel alloy cladding) piping, piping components, tanks exposed to treated borated water >60°C (>140°F)	Cracking due to SCC	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191. In addition to Engineered Safety Features systems, components in Reactor Vessel, Internals, and Reactor Coolant System are aligned to this item.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-022	Nickel alloy, stainless steel heat exchanger components, piping, piping components, tanks exposed to treated water, treated borated water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Consistent with NUREG-2191. In addition to Engineered Safety Features systems, components in Reactor Vessel, Internals, and Reactor Coolant System are aligned to this item.
3.2.1-023	Steel heat exchanger components, piping, piping components exposed to raw water	Loss of material due to general, pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.
3.2.1-024	Stainless steel piping, piping components exposed to raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No	Not applicable. ONS has no stainless steel piping or piping components exposed to raw water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-025	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-027	Stainless steel, steel heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.
3.2.1-028	Stainless steel piping, piping components exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to SCC	AMP XI.M21A, "Closed Treated Water Systems"	No	Not applicable. ONS has no stainless steel piping or piping components exposed to closed-cycle cooling water >60°C (>140°F) in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-029	Steel piping, piping components exposed to closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No	Not applicable. ONS has no steel piping or piping components exposed to closed-cycle cooling water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-030	Steel heat exchanger components exposed to closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-2191.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-031	Stainless steel heat exchanger components, piping, piping components exposed to closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No	Not applicable. ONS has no stainless steel heat exchanger components, piping, or piping components exposed to closed-cycle cooling water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-032	Copper alloy heat exchanger components, piping, piping components exposed to closed- cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No	Not applicable. ONS has no copper alloy heat exchanger components, piping, or piping components exposed to closed-cycle cooling water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-033	Copper alloy, stainless steel heat exchanger tubes exposed to closed- cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No	Not applicable. ONS has no copper alloy or stainless steel heat exchanger tubes exposed to closed-cycle cooling water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-034	Copper alloy (>15% Zn or >8% Al) piping, piping components, heat exchanger components exposed to closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No	Not applicable. ONS has no copper alloy (>15% Zn or >8% Al) piping, piping components, or heat exchanger components exposed to closed-cycle cooling water or treated water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-035	Gray cast iron motor cooler exposed to closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No	Not applicable. ONS has no gray cast iron motor cooler exposed to closed-cycle cooling water or treated water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-036	Gray cast iron, ductile iron piping, piping components exposed to closed-cycle cooling water, treated water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No	Not applicable. ONS has no gray cast iron or ductile iron piping or piping components exposed to closed-cycle cooling water or treated water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-037	Gray cast iron, ductile iron piping, piping components exposed to soil	Loss of material due to selective leaching	AMP XI.M33, “Selective Leaching”	No	Not applicable. ONS has no gray cast iron or ductile iron piping or piping components exposed to soil in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-038	Elastomer piping, piping components, seals exposed to air, condensation	Hardening or loss of strength due to elastomer degradation	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Not applicable. ONS has no elastomer piping, piping components, or seals exposed to air or condensation in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-040	Steel external surfaces exposed to air – indoor uncontrolled, air – outdoor, condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-2191. In addition to Engineered Safety Features systems, components in Reactor Vessel, Internals, and Reactor Coolant System are aligned to this item.
3.2.1-042	Aluminum piping, piping components, tanks exposed to air, condensation (external)	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.2.2.2.10)	Not applicable. ONS has no aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation (external) in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-043	Elastomer piping, piping components, seals exposed to air, condensation	Hardening or loss of strength due to elastomer degradation	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no elastomer piping, piping components, or seals exposed to air or condensation in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-044	Steel piping, piping components, ducting, ducting components exposed to air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no steel piping, piping components, ducting, or ducting components exposed to air – indoor uncontrolled in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-045	Steel encapsulation components exposed to air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no steel encapsulation components exposed to air – indoor uncontrolled in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-046	Steel piping, piping components exposed to condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no steel piping or piping components exposed to condensation in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-047	Steel encapsulation components exposed to air with borated water leakage	Loss of material due to general, pitting, crevice, boric acid corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no steel encapsulation components exposed to air with borated water leakage in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-048	Stainless steel, nickel alloy piping, piping components, tanks exposed to air, condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.2)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that loss of material is not occurring in stainless steel components exposed to air-indoor uncontrolled (internal) environments. See further evaluation in Section 3.2.2.2.2.
3.2.1-049	Steel piping, piping components exposed to lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No	Consistent with NUREG-2191. ONS has no copper alloy or stainless steel piping or piping components exposed to lubricating oil in the scope of subsequent license renewal in Engineered Safety Features systems. Components in Reactor Vessel, Internals, and Reactor Coolant System are aligned to this item.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-050	Copper alloy, stainless steel piping, piping components exposed to lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No	Consistent with NUREG-2191. ONS has no copper alloy or stainless or steel piping or piping components exposed to lubricating oil in the scope of subsequent license renewal in Engineered Safety Features systems. Components in Reactor Vessel, Internals, and Reactor Coolant System are aligned to this item.
3.2.1-051	Steel, copper alloy, stainless steel heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No	Not applicable. ONS has no steel, copper alloy, or stainless steel heat exchanger tubes exposed to lubricating oil in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-052	Steel piping, piping components exposed to soil, concrete, underground	Loss of material due to general, pitting, crevice corrosion, MIC (soil only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no steel piping or piping components exposed to soil, concrete, or underground in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-053	Stainless steel, nickel alloy piping, piping components, tanks, exposed to soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil only)	AMP XI.M41, “Buried and Underground Piping and Tanks”	No	Not applicable. ONS has no stainless steel or nickel alloy piping, piping components, or tanks exposed to soil or concrete in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-054	Stainless steel, nickel alloy piping, piping components greater than or equal to 4 NPS exposed to treated water >93°C (>200°F)	Cracking due to SCC, IGSCC	AMP XI.M7, “BWR Stress Corrosion Cracking,” and AMP XI.M2, “Water Chemistry”	No	Not applicable - BWR only
3.2.1-055	Steel piping, piping components exposed to concrete	None	None	Yes (SRP-SLR Section 3.2.2.2.9)	Not applicable. ONS has no steel piping or piping components exposed to concrete in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-056	Aluminum piping, piping components, tanks exposed to air, condensation (internal)	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” or AMP-XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.10)	Not applicable. ONS has no aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation (internal) in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-057	Copper alloy piping, piping components exposed to air, condensation, gas	None	None	No	Not applicable. ONS has no copper alloy piping, or piping components exposed to air, condensation, gas in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-058	Copper alloy, copper alloy (>8% Al) piping, piping components exposed to air with borated water leakage	None	None	No	Consistent with NUREG-2191. ONS has no in-scope copper alloy piping, piping components exposed to air, condensation, or gas in the scope of subsequent license renewal in Engineered Safety Features systems. Components in Reactor Vessel, Internals, and Reactor Coolant System are aligned to this item.
3.2.1-059	Galvanized steel ducting, ducting components, piping, piping components exposed to air – indoor controlled	None	None	No	Not applicable. ONS has no galvanized steel ducting, ducting components, piping, or piping components exposed to air – indoor controlled in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-060	Glass piping elements exposed to air, underground, lubricating oil, raw water, treated water, treated borated water, air with borated water leakage, condensation, gas, closed-cycle cooling water	None	None	No	Consistent with NUREG-2191.
3.2.1-062	Nickel alloy piping, piping components exposed to air with borated water leakage	None	None	No	Not applicable. ONS has no nickel alloy piping or piping components exposed to air with borated water leakage in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-063	Stainless steel piping, piping components exposed to air with borated water leakage, gas	None	None	No	Consistent with NUREG-2191.
3.2.1-064	Steel piping, piping components exposed to air – indoor controlled, gas	None	None	No	Not applicable. ONS has no steel piping, piping components exposed to air – indoor controlled or gas in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-065	Metallic piping, piping components exposed to treated water, treated borated water	Wall thinning due to erosion	AMP XI.M17, “Flow-Accelerated Corrosion”	No	Consistent with NUREG-2191.
3.2.1-066	Metallic piping, piping components, tanks exposed to raw water, waste water	Loss of material due to recurring internal corrosion	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	Yes (SRP-SLR Section 3.2.2.2.7)	Not applicable. The associated NUREG-2191 aging items are not used.
3.2.1-067	Stainless steel tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to soil, concrete	Cracking due to SCC	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks”	No	Not applicable. ONS has no stainless steel tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to soil or concrete in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-068	Steel tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to soil, concrete, air, condensation	Loss of material due to general, pitting, crevice corrosion, MIC (soil only)	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”	No	Consistent with NUREG-2191.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-069	Insulated steel piping, piping components, tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to air, condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components” or AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks”	No	Not applicable. ONS has no insulated steel piping or piping components in the scope of subsequent license renewal in Engineered Safety Features systems. Insulated steel tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) maintain an air gap between the insulation and tank exterior such that the insulation is not in contact with the tank. The associated NUREG-2191 aging items are not used.
3.2.1-070	Steel, stainless steel, aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to treated water, treated borated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC (steel, stainless steel only)	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”	No	Not applicable. ONS has no steel, stainless steel, or aluminum tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to treated water or treated borated water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-071	Insulated copper alloy (>15% Zn or >8% Al) piping, piping components, tanks exposed to air, condensation	Cracking due to SCC	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components”	No	Not applicable. ONS has no insulated copper alloy (>15% Zn or >8% Al) piping, piping components, or tanks exposed to air or condensation in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-072	Any material piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, condensation	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage; loss of material or cracking for cementitious coatings/linings	AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (B2.1.27) program implementation.
3.2.1-073	Any material piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, lubricating oil, condensation	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (B2.1.27) program implementation.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-074	Gray cast iron, ductile iron piping, piping components with internal coatings/linings exposed to closed- cycle cooling water, raw water, treated water, treated borated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Not applicable. ONS has no gray cast iron or ductile iron piping or piping components with internal coatings/ linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or waste water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-076	Stainless steel, steel, nickel alloy, copper alloy closure bolting exposed to treated water, treated borated water, raw water, waste water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC (steel, copper alloy in raw water, waste water only)	AMP XI.M18, "Bolting Integrity"	No	Not applicable. ONS has no stainless steel, steel, nickel alloy, or copper alloy closure bolting exposed to treated water, treated borated water, raw water, waste water, or lubricating oil in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-078	Stainless steel, steel, aluminum piping, piping components, tanks exposed to soil, concrete	Cracking due to SCC (steel in carbonate/ bicarbonate environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no stainless steel, steel, aluminum piping, piping components, tanks exposed to soil or concrete environment, or steel exposed to a carbonate/bicarbonate environment, in the scope of subsequent license renewal in Engineered Safety Features systems. Aging effects applicable to the Borated Water Storage Tank exposed to concrete are addressed in Item 3.2.1-068. The associated NUREG-2191 aging items are not used.
3.2.1-079	Stainless steel closure bolting exposed to air, soil, concrete, underground	Cracking due to SCC	AMP XI.M18, "Bolting Integrity"	No	Consistent with NUREG-2191.
3.2.1-080	Stainless steel underground piping, piping components, tanks	Cracking due to SCC	AMP XI.M32, "One Time Inspection," AMP XI.M41, "Buried and Underground Piping and Tanks," or AMP XI.M42, "Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.4)	Not applicable. ONS has no stainless steel underground piping, piping components, or tanks in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-081	Stainless steel, steel, aluminum, copper alloy, titanium heat exchanger tubes exposed to air, condensation	Reduction of heat transfer due to fouling	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. ONS has no stainless steel, steel, aluminum, copper alloy, or titanium heat exchanger tubes exposed to air or condensation in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-087	Non-metallic thermal insulation exposed to air, condensation	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-2191.
3.2.1-090	Steel components exposed to treated water, treated borated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection"	No	Consistent with NUREG-2191. In addition to Engineered Safety Features systems, components in Auxiliary Systems are aligned to this item.
3.2.1-091	Stainless steel piping, piping components exposed to concrete	None	None	Yes (SRP-SLR Section 3.2.2.2.9)	Not applicable. ONS has no in-scope stainless steel piping or piping components exposed to concrete in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-096	Steel, stainless steel piping, piping components exposed to raw water (for components not covered by NRC GL 89-13)	Loss of material due to general (steel only), pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no steel or stainless steel piping or piping components exposed to raw water (for components not covered by NRC GL 89-13) in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-098	Copper alloy (>15% Zn or >8% Al) piping, piping components exposed to soil	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No	Not applicable. ONS has no copper alloy (>15% Zn or >8% Al) piping or piping components exposed to soil in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-099	Stainless steel, nickel alloy tanks exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.2)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be used to confirm that loss of material is not occurring in stainless steel tanks exposed to air-indoor uncontrolled environments. See further evaluation in Section 3.2.2.2.2.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-100	Aluminum piping, piping components, tanks exposed to air, condensation (internal), raw water, waste water	Cracking due to SCC	AMP XI.M32, “One Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.2.2.2.8)	Not applicable. ONS has no in-scope aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation (internal) raw water, or waste water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-101	Aluminum piping, piping components, tanks exposed to air, condensation (external)	Cracking due to SCC	AMP XI.M32, "One Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.8)	Not applicable. ONS has no aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation (external) in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-102	Aluminum tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to air, condensation, soil, concrete, raw water, waste water	Cracking due to SCC	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.8)	Not applicable. ONS has no aluminum or aluminum alloy tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to air, condensation, soil, concrete, raw water, waste water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-103	Stainless steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to air, condensation	Cracking due to SCC	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.4)	Not applicable. ONS has no stainless steel tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to air, condensation in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-104	Aluminum tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”	No	Not applicable. ONS has no aluminum tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to soil or concrete in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-105	Aluminum tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.10)	Not applicable. ONS has no aluminum or aluminum alloy tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to air, condensation in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-106	Stainless steel, nickel alloy tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.2)	Not applicable. ONS has no stainless steel or nickel alloy tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to air, condensation in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-107	Insulated stainless steel, nickel alloy piping, piping components, tanks exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.2)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to demonstrate that loss of material is not occurring in insulated stainless steel or nickel alloy piping and piping components exposed to air-indoor uncontrolled environments. See further evaluation in Section 3.2.2.2.2.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-108	Insulated stainless steel piping, piping components, tanks exposed to air, condensation	Cracking due to SCC	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.2.2.2.4)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to demonstrate that cracking is not occurring in insulated stainless steel piping and piping components exposed to air-indoor uncontrolled environments. See further evaluation in Section 3.2.2.2.4.
3.2.1-109	Insulated aluminum piping, piping components, tanks exposed to air, condensation	Cracking due to SCC	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.2.2.2.8)	Not applicable. ONS has no insulated aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-110	Aluminum underground piping, piping components, tanks	Cracking due to SCC	AMP XI.M32, “One-Time Inspection,” AMP XI.M41, “Buried and Underground Piping and Tanks,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.8)	Not applicable. ONS has no underground aluminum or aluminum alloy piping, piping components, or tanks in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-111	Aluminum underground piping, piping components, tanks	Loss of material due to pitting, crevice corrosion	AMP XI.M32, “One-Time Inspection,” AMP XI.M41, "Buried and Underground Piping and Tanks,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.10)	Not applicable. ONS has no underground aluminum or aluminum alloy piping, piping components, or tanks in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-112	Stainless steel, nickel alloy underground piping, piping components, tanks	Loss of material due to pitting, crevice corrosion	AMP XI.M32, “One-Time Inspection,” AMP XI.M41, “Buried and Underground Piping and Tanks,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.2)	Not applicable. ONS has no underground stainless steel or nickel alloy piping, piping, or tanks components in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-114	Stainless steel, nickel alloy piping, piping components exposed to treated water >60°C (>140°F)	Cracking due to SCC	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. ONS has no stainless steel or nickel alloy piping or piping components exposed to treated water >60°C (>140°F) in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-115	Titanium heat exchanger tubes exposed to treated water	Cracking due to SCC, reduction of heat transfer due to fouling	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. ONS has no titanium heat exchanger tubes exposed to treated water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-116	Titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, piping components exposed to treated water	None	None	No	Not applicable. ONS has no titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, or piping components exposed to treated water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-117	Titanium heat exchanger tubes exposed to closed-cycle cooling water	Cracking due to SCC, reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems”	No	Not applicable. ONS has no titanium heat exchanger tubes exposed to closed-cycle cooling water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-118	Titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, piping components exposed to closed-cycle cooling water	None	None	No	Not applicable. ONS has no titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, piping components exposed to closed-cycle cooling water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-119	Insulated aluminum piping, piping components, tanks exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.10)	Not applicable. ONS has no insulated aluminum or aluminum alloy piping, piping components, or tanks exposed to air or condensation in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-120	Aluminum piping, piping components, tanks exposed to soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no aluminum piping, piping components, or tanks exposed to soil or concrete in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-121	Aluminum piping, piping components, tanks exposed to raw water, waste water	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.2.2.2.10)	Not applicable. ONS has no aluminum or aluminum alloy piping, piping components, or tanks exposed to raw water or waste water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-122	Elastomer piping, piping components, seals exposed to air	Loss of material due to wear	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. ONS has no elastomer piping, piping components, or seals exposed to air in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-123	Elastomer piping, piping components, seals exposed to air	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no elastomer piping, piping components, or seals exposed to air in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-124	Aluminum piping, piping components, tanks exposed to air with borated water leakage	None	None	No	Not applicable. ONS has no aluminum piping, piping components, or tanks exposed to air with borated water leakage in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-125	Steel closure bolting exposed to soil, concrete, underground	Loss of material due to general, pitting, crevice corrosion, MIC (soil only)	AMP XI.M41, “Buried and Underground Piping and Tanks”	No	Not applicable. ONS has no steel closure bolting exposed to soil, concrete, or underground in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-126	Titanium, super austenitic piping, piping components, tanks, closure bolting exposed to soil, concrete, underground	Loss of material due to pitting, crevice corrosion, MIC (except for titanium; soil environment only)	AMP XI.M41, “Buried and Underground Piping and Tanks”	No	Not applicable. ONS has no titanium, super austenitic piping, piping components, tanks, or closure bolting exposed to soil, concrete, or underground in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-127	Copper alloy piping, piping components exposed to concrete	None	None	No	Not applicable. ONS has no copper alloy piping, piping components exposed to concrete in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-128	Copper alloy piping, piping components exposed to soil, underground	Loss of material due to general, pitting, crevice corrosion, MIC (soil only)	AMP XI.M41, “Buried and Underground Piping and Tanks”	No	Not applicable. ONS has no copper alloy piping, piping components exposed to soil, underground in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-129	Stainless steel tanks exposed to soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil only)	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks”	No	Not applicable. ONS has no stainless steel tanks exposed to soil or concrete in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-130	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. ONS has no steel heat exchanger components exposed to lubricating oil in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-131	Aluminum piping, piping components exposed to raw water	Flow blockage due to fouling	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no aluminum piping or piping components exposed to raw water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-132	Titanium (ASTM Grades 3, 4, or 5) heat exchanger tubes exposed to raw water	Cracking due to SCC	AMP XI.M20, "Open-Cycle Cooling Water System”	No	Not applicable. ONS has no titanium (ASTM Grades 3, 4, or 5) heat exchanger tubes exposed to raw water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.
3.2.1-133	Titanium piping, piping components, heat exchanger components exposed to raw water	Cracking due to SCC, flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System”	No	Not applicable. ONS has no titanium piping, piping components, or heat exchanger components exposed to raw water in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-134	Polymeric piping, piping components, ducting, ducting components, seals exposed to air, condensation, raw water, raw water (potable), treated water, waste water, underground, concrete, soil	Hardening or loss of strength due to polymeric degradation; loss of material due to peeling, delamination, wear; cracking or blistering due to exposure to ultraviolet light, ozone, radiation, or chemical attack; flow blockage due to fouling	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no polymeric piping, piping components, ducting, ducting components, or seals exposed to air, condensation, raw water, raw water (potable), treated water, waste water, underground, concrete, or soil in the scope of subsequent license renewal in Engineered Safety Features systems. The associated NUREG-2191 aging items are not used.

Results Tables: Engineered Safety Features AMR Results

Table 3.2.2-1 Engineered Safety Features - Reactor Building Spray System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	V.E.E-421	3.2.1- 079	A
				Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	V.E.E-421	3.2.1- 079	A
				Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A

Table 3.2.2-1 Engineered Safety Features - Reactor Building Spray System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Flexible Connection	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A

Table 3.2.2-1 Engineered Safety Features - Reactor Building Spray System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A

Table 3.2.2-1 Engineered Safety Features - Reactor Building Spray System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Insulation	Thermal Resistance	Fiberglass	Air – Indoor Uncontrolled (External)	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B2.1.23)	V.E.E-422	3.2.1- 087	A
Orifice	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-1 Engineered Safety Features - Reactor Building Spray System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Flow Restriction	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
						V.E.E-451b	3.2.1- 108	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
						V.E.E-450b	3.2.1- 107	A

Table 3.2.2-1 Engineered Safety Features - Reactor Building Spray System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-81b	3.2.1- 048	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-81b	3.2.1- 048	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A

Table 3.2.2-1 Engineered Safety Features - Reactor Building Spray System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Pump Casing (reactor building spray)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-1 Engineered Safety Features - Reactor Building Spray System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	V.F.EP-15	3.2.1- 060	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-65	3.2.1- 060	A
			Treated Borated Water (Internal)	None	None	V.F.EP-30	3.2.1- 060	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Spray Nozzle	Spray Pattern	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A

Table 3.2.2-1 Engineered Safety Features - Reactor Building Spray System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Spray Nozzle	Spray Pattern	Stainless Steel	Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-81b	3.2.1- 048	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-81b	3.2.1- 048	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-1 Engineered Safety Features - Reactor Building Spray System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. None.

Table 3.2.2-2 Engineered Safety Features - Core Flood System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	V.E.E-421	3.2.1- 079	A
				Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	V.E.E-421	3.2.1- 079	A
				Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A

Table 3.2.2-2 Engineered Safety Features - Core Flood System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Gas (Internal)	None	None	V.F.EP-22	3.2.1- 063	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
						V.E.E-451b	3.2.1- 108	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
						V.E.E-450b	3.2.1- 107	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Gas (Internal)	None	None	V.F.EP-22	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-2 Engineered Safety Features - Core Flood System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Gas (Internal)	None	None	V.F.EP-22	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Tank (core flood)	Pressure Boundary	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	V.E.E-44	3.2.1- 040	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A

Table 3.2.2-2 Engineered Safety Features - Core Flood System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (core flood)	Pressure Boundary	Steel (with Stainless Steel Cladding)	Gas (Internal)	None	None	V.F.EP-22	3.2.1- 063	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Gas (Internal)	None	None	V.F.EP-22	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-2 Engineered Safety Features - Core Flood System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Gas (Internal)	None	None	V.F.EP-22	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A

Plant Specific Notes:

1. None.

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	V.E.E-421	3.2.1- 079	A
				Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	V.E.E-421	3.2.1- 079	A
				Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Filter Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Body	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Flexible Connection	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Heat Exchanger (letdown cooler) Head	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	C
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	C

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (letdown cooler) Head	Structural Integrity	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	VII.E1.AP-119	3.3.1- 008	A
					One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	C
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	C
Heat Exchanger (letdown cooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	V.E.E-44	3.2.1- 040	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	V.A.EP-92	3.2.1- 030	A
Heat Exchanger (reactor coolant seal return cooler) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	V.E.E-44	3.2.1- 040	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (reactor coolant seal return cooler) Head	Structural Integrity	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	V.A.EP-92	3.2.1- 030	A
Heat Exchanger (reactor coolant seal return cooler) Shell	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	C
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	VII.E1.AP-119	3.3.1- 008	A
					One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	C
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	C

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Insulation	Thermal Resistance	Fiberglass	Air – Indoor Uncontrolled (External)	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B2.1.23)	V.E.E-422	3.2.1- 087	A
Orifice	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
						V.D1.E-24	3.2.1- 005	A, 1
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
						V.D1.E-24	3.2.1- 005	A, 1
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
						V.E.E-451b	3.2.1- 108	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
						V.E.E-450b	3.2.1- 107	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	V.D1.E-407	3.2.1- 065	A,3
			Treated Borated water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	V.D1.E-13	3.2.1- 001	A,3
	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	V.D1.E-13	3.2.1- 001	A,3
Pulsation Dampener	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pulsation Dampener	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Pump Casing (high pressure injection)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	VII.E1.AP-115	3.3.1- 007	A
					One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Pump Casing (standby shutdown facility reactor coolant makeup)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (standby shutdown facility reactor coolant makeup)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	V.F.EP-15	3.2.1- 060	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-65	3.2.1- 060	A
			Treated Borated Water (Internal)	None	None	V.F.EP-30	3.2.1- 060	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Strainer Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Screen	Filtration	Stainless Steel	Treated Borated Water (External)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated Water >60°C (>140°F) (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Tank (letdown storage)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.E.E-442a	3.2.1- 099	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Gas (Internal)	None	None	V.F.EP-22	3.2.1- 063	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (purification demineralizer)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.E.E-442a	3.2.1- 099	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Cast Austenitic Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated Water >250°C (>482°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
				Loss of Fracture Toughness	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	V.D1.E-47	3.2.1- 010	E,2
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A

Table 3.2.2-3 Engineered Safety Features - High Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A

Plant Specific Notes:

1. Loss of material due to erosion is an aging effect requiring management for HPI miniflow recirculation orifices only.
2. In accordance with NUREG-2191 Chapter XI.M12 and NRC Letter dated 5/19/2000 (ML003717179), valve bodies are adequately covered by existing inspection requirements in Section XI of the ASME Code.
3. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	V.E.E-421	3.2.1- 079	A
				Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	V.E.E-421	3.2.1- 079	A
				Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	V.E.E-02	3.2.1- 014	A
				Loss of Preload	Bolting Integrity (B2.1.9)	V.E.EP-116	3.2.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Emergency Sump Strainer (decay heat removal)	Filtration	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
Flexible Connection	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Heat Exchanger (decay heat removal cooler) Head	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	C
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	C
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (decay heat removal cooler) Head	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	C
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	C
Heat Exchanger (decay heat removal cooler) Shell	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	V.E.E-44	3.2.1- 040	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	V.A.E-434	3.2.1- 090	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	V.A.EP-90	3.2.1- 023	B
Heat Exchanger (decay heat removal cooler) Tubes	Heat Transfer	Stainless Steel	Raw Water (External)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	V.D1.E-21	3.2.1- 027	B
			Treated Borated Water (Internal)	Reduction of Heat Transfer	One-Time Inspection (B2.1.20)	V.A.E-20	3.2.1- 019	A
					Water Chemistry (B2.1.2)	V.A.E-20	3.2.1- 019	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (decay heat removal cooler) Tubes	Pressure Boundary	Stainless Steel	Raw Water (External)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	V.A.EP-91	3.2.1- 025	B
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Heat Exchanger (decay heat removal cooler) Tubesheet	Pressure Boundary	Stainless Steel	Raw Water (External)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	V.A.EP-91	3.2.1- 025	B
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	C
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	C

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Insulation	Thermal Resistance	Fiberglass	Air – Indoor Uncontrolled (External)	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B2.1.23)	V.E.E-422	3.2.1- 087	A
Orifice	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
						V.E.E-451b	3.2.1- 108	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
						V.E.E-450b	3.2.1- 107	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-81b	3.2.1- 048	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-81b	3.2.1- 048	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	V.D1.E-13	3.2.1- 001	A,1
	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	V.D1.E-13	3.2.1- 001	A,1
Pump Casing (decay heat removal)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	V.F.EP-15	3.2.1- 060	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-65	3.2.1- 060	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Glass	Treated Borated Water (Internal)	None	None	V.F.EP-30	3.2.1- 060	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Strainer Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Strainer Screen	Filtration	Stainless Steel	Treated Borated Water (External)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated Water >60°C (>140°F) (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
Tank (borated water storage)	Pressure Boundary	Steel with Internal Coating/Lining	Air – Indoor Uncontrolled (External)	Loss of Material	Outdoor and Large Atmospheric Metallic Storage Tanks (B2.1.17)	V.D1.E-402	3.2.1- 068	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	V.E.E-28	3.2.1- 009	A
			Concrete (External)	Loss of Material	Outdoor and Large Atmospheric Metallic Storage Tanks (B2.1.17)	V.D1.E-402	3.2.1- 068	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (borated water storage)	Pressure Boundary	Steel with Internal Coating/Lining	Treated Borated Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	V.A.E-401	3.2.1- 072	B
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	V.A.E-414	3.2.1- 073	B
Valve Body	Pressure Boundary	Cast Austenitic Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated Water >250°C (>482°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Cast Austenitic Stainless Steel	Treated Borated Water >250°C (>482°F) (Internal)	Loss of Fracture Toughness	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	V.D1.E-47	3.2.1- 010	E,2
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-81b	3.2.1- 048	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A

Table 3.2.2-4 Engineered Safety Features - Low Pressure Injection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	V.C.EP-107a	3.2.1- 004	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.EP-103b	3.2.1- 007	A
				Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-81b	3.2.1- 048	A
			Air with Borated Water Leakage (External)	None	None	V.F.EP-19	3.2.1- 063	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	V.A.EP-41	3.2.1- 022	A
					Water Chemistry (B2.1.2)	V.A.EP-41	3.2.1- 022	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	V.A.E-12	3.2.1- 020	A
					Water Chemistry (B2.1.2)	V.A.E-12	3.2.1- 020	A

Plant Specific Notes:

1. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.
2. In accordance with NUREG-2191 Chapter XI.M12 and NRC Letter dated 5/19/2000 (ML003717179), valve bodies are adequately covered by existing inspection requirements in Section XI of the ASME Code.

Tables 3.2.2-1 through 3.2.2-4 Industry Standard Notes:

A. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

B. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-2191 AMP.

C. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

D. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP takes some exceptions to the NUREG-2191 AMP.

E. Consistent with NUREG-2191 item for material, environment, and aging effect, but a different AMP is credited or NUREG-2191 identifies a plant-specific AMP.

F. Material not in NUREG-2191 for this component.

G. Environment not in NUREG-2191 for this component and material.

H. Aging effect not in NUREG-2191 for this component, material and environment combination.

I. Aging effect in NUREG-2191 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-2191.

3.3 AGING MANAGEMENT OF AUXILIARY SYSTEMS

3.3.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.3, Auxiliary Systems, as being subject to aging management review. The systems, or portions of systems, which are addressed in this section are described in the indicated sections:

- Air Gas Related Systems (Section 2.3.3.1)
- Ancillary Related Systems (Section 2.3.3.2)
- Closed Cycle Water Related Systems (Section 2.3.3.3)
- Fire Protection Related Systems (Section 2.3.3.4)
- Heating Ventilation and Air Conditioning Related Systems (Section 2.3.3.5)
- Lube Oil Related Systems (Section 2.3.3.6)
- Miscellaneous Related Systems (Section 2.3.3.7)
- Miscellaneous Oil Related Systems (Section 2.3.3.8)
- Raw Water Related Systems (Section 2.3.3.9)
- Standby Shutdown Facility Diesel Generator Related Systems (Section 2.3.3.10)
- Waste Disposal Related Systems (Section 2.3.3.11)

3.3.2 RESULTS

The following tables summarize the results of the aging management review for Auxiliary Systems:

- Table 3.3.2-1, Auxiliary Systems - Auxiliary Instrument Air System - Aging Management Evaluation
- Table 3.3.2-2, Auxiliary Systems - Breathing Air System - Aging Management Evaluation
- Table 3.3.2-3, Auxiliary Systems - Hydrogen System - Aging Management Evaluation
- Table 3.3.2-4, Auxiliary Systems - Instrument Air System - Aging Management Evaluation
- Table 3.3.2-5, Auxiliary Systems - Keowee Air Breaker System - Aging Management Evaluation
- Table 3.3.2-6, Auxiliary Systems - Keowee Depressing Air System - Aging Management Evaluation
- Table 3.3.2-7, Auxiliary Systems - Keowee Governor Air System - Aging Management Evaluation
- Table 3.3.2-8, Auxiliary Systems - Keowee Station Air System - Aging Management Evaluation
- Table 3.3.2-9, Auxiliary Systems - Nitrogen Purge and Blanket System - Aging Management Evaluation
- Table 3.3.2-10, Auxiliary Systems - Service Air System - Aging Management Evaluation

- Table 3.3.2-11, Auxiliary Systems - Standby Shutdown Facility Fire Protection System - Aging Management Evaluation
- Table 3.3.2-12, Auxiliary Systems – Chemical Addition System - Aging Management Evaluation
- Table 3.3.2-13, Auxiliary Systems – Coolant Storage System - Aging Management Evaluation
- Table 3.3.2-14, Auxiliary Systems – Coolant Treatment System - Aging Management Evaluation
- Table 3.3.2-15, Auxiliary Systems – Demineralized Water System - Aging Management Evaluation
- Table 3.3.2-16, Auxiliary Systems - Essential Siphon Vacuum System - Aging Management Evaluation
- Table 3.3.2-17, Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation
- Table 3.3.2-18, Auxiliary Systems – Alternate Chilled Water System - Aging Management Evaluation
- Table 3.3.2-19, Auxiliary Systems – Component Cooling Water System - Aging Management Evaluation
- Table 3.3.2-20, Auxiliary Systems – Chilled Water (Non-Vital Loads) System - Aging Management Evaluation
- Table 3.3.2-21, Auxiliary Systems – Recirculating Cooling Water System - Aging Management Evaluation
- Table 3.3.2-22, Auxiliary Systems - Sample Cooling Water System - Aging Management Evaluation
- Table 3.3.2-23, Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation
- Table 3.3.2-24, Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation
- Table 3.3.2-25, Auxiliary Systems - Keowee Service Water System - Aging Management Evaluation
- Table 3.3.2-26, Auxiliary Systems - Keowee Fire Detection/Protection System - Aging Management Evaluation
- Table 3.3.2-27, Auxiliary Systems - Reactor Building Cooling and Ventilation Systems - Aging Management Evaluation
- Table 3.3.2-28, Auxiliary Systems - Reactor Building Purge System - Aging Management Evaluation
- Table 3.3.2-29, Auxiliary Systems - Ventilation Systems - Aging Management Evaluation
- Table 3.3.2-30, Auxiliary Systems - Lube Oil System - Aging Management Evaluation
- Table 3.3.2-31, Auxiliary Systems - Keowee Turbine Guide Bearing Oil System - Aging Management Evaluation
- Table 3.3.2-32, Auxiliary Systems - Keowee Lube Oil System - Aging Management Evaluation
- Table 3.3.2-33, Auxiliary Systems - Filtered Water System - Aging Management Evaluation
- Table 3.3.2-34, Auxiliary Systems - Keowee Main Turbine System - Aging Management Evaluation

- Table 3.3.2-35, Auxiliary Systems - Leak Rate Test System - Aging Management Evaluation
- Table 3.3.2-36, Auxiliary Systems - Plant Drinking Water System - Aging Management Evaluation
- Table 3.3.2-37, Auxiliary Systems - Radiation Monitoring System - Aging Management Evaluation
- Table 3.3.2-38, Auxiliary Systems - Stator Coolant System - Aging Management Evaluation
- Table 3.3.2-39, Auxiliary Systems - Station Sewage Disposal System - Aging Management Evaluation
- Table 3.3.2-40, Auxiliary Systems - Keowee Turbine Sump Pump System - Aging Management Evaluation
- Table 3.3.2-41, Auxiliary Systems - Vacuum System - Aging Management Evaluation
- Table 3.3.2-42, Auxiliary Systems - Electro-Hydraulic Control System - Aging Management Evaluation
- Table 3.3.2-43, Auxiliary Systems - Fuel Oil System - Aging Management Evaluation
- Table 3.3.2-44, Auxiliary Systems - Keowee Generator High Pressure Oil System - Aging Management Evaluation
- Table 3.3.2-45, Auxiliary Systems - Keowee Governor Oil System - Aging Management Evaluation
- Table 3.3.2-46, Auxiliary Systems - Refueling System - Aging Management Evaluation
- Table 3.3.2-47, Auxiliary Systems - Hydrogen Seal Oil System - Aging Management Evaluation
- Table 3.3.2-48, Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation
- Table 3.3.2-49, Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation
- Table 3.3.2-50, Auxiliary Systems - Protected Service Water System - Aging Management Evaluation
- Table 3.3.2-51, Auxiliary Systems - Siphon Seal Water System - Aging Management Evaluation
- Table 3.3.2-52, Auxiliary Systems - Keowee Turbine Generator Cooling Water System - Aging Management Evaluation
- Table 3.3.2-53, Auxiliary Systems - Standby Shutdown Facility Air Intake and Exhaust System - Aging Management Evaluation
- Table 3.3.2-54, Auxiliary Systems - Standby Shutdown Facility Diesel Jacket Water Cooling System - Aging Management Evaluation
- Table 3.3.2-55, Auxiliary Systems - Standby Shutdown Facility Diesel Lube Oil System - Aging Management Evaluation
- Table 3.3.2-56, Auxiliary Systems - Standby Shutdown Facility Fuel Oil System - Aging Management Evaluation
- Table 3.3.2-57, Auxiliary Systems - Standby Shutdown Facility Starting Air System - Aging Management Evaluation

- Table 3.3.2-58, Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation
- Table 3.3.2-59, Auxiliary Systems- Liquid Waste Disposal System - Aging Management Evaluation

3.3.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.3.2.1.1 Auxiliary Instrument Air System

Materials

Components in the Auxiliary Instrument Air System are constructed of the following materials:

* Galvanized Steel
* Stainless Steel
* Steel

Environments

Components in the Auxiliary Instrument Air System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Waste Water

Aging Effects Requiring Management

Components in the Auxiliary Instrument Air System require aging management to address the following aging effects:

* Cracking
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Auxiliary Instrument Air System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)

3.3.2.1.2 Breathing Air System

Materials

Components in the Breathing Air System are constructed of the following materials:

* Stainless Steel
* Steel

Environments

Components in the Breathing Air System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Condensation
* Waste Water

Aging Effects Requiring Management

Components in the Breathing Air System require aging management to address the following aging effects:

* Cracking
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Breathing Air System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)

* One-Time Inspection (B2.1.20)

3.3.2.1.3 Hydrogen System

Materials

Components in the Hydrogen System are constructed of the following materials:

* Copper Alloy
* Glass
* Stainless Steel
* Steel

Environments

Components in the Hydrogen System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Treated Water
* Waste Water

Aging Effects Requiring Management

Components in the Hydrogen System require aging management to address the following aging effects:

* Cracking
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Hydrogen System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Water Chemistry (B2.1.2)

3.3.2.1.4 Instrument Air System

Materials

Components in the Instrument Air System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Elastomer
* Galvanized Steel
* Glass
* Stainless Steel
* Steel

Environments

Components in the Instrument Air System are exposed to the following environments:

* Air – Dry
* Air – Indoor Uncontrolled
* Air – Outdoor
* Air with Borated Water Leakage
* Condensation
* Raw Water
* Soil
* Waste Water

Aging Effects Requiring Management

Components in the Instrument Air System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage

* Flow Blockage
* Hardening or Loss of Strength
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Instrument Air System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Buried and Underground Piping and Tanks (B2.1.26)
* Compressed Air Monitoring (B2.1.14)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Fire Water System (B2.1.16)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* TLAA

3.3.2.1.5 Keowee Air Breaker System

Materials

Components in the Keowee Air Breaker System are constructed of the following materials:

* Copper Alloy
* Stainless Steel
* Steel

Environments

Components in the Keowee Air Breaker System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Condensation
* Waste Water

Aging Effects Requiring Management

Components in the Keowee Air Breaker System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Keowee Air Breaker System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)

* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)

3.3.2.1.6 Keowee Depressing Air System

Materials

Components in the Keowee Depressing Air System are constructed of the following materials:

* Galvanized Steel
* Stainless Steel
* Steel

Environments

Components in the Keowee Depressing Air System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Waste Water

Aging Effects Requiring Management

Components in the Keowee Depressing Air System require aging management to address the following aging effects:

* Cracking
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Keowee Depressing Air System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)

* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)

3.3.2.1.7 Keowee Governor Air System

Materials

Components in the Keowee Governor Air System are constructed of the following materials:

- Stainless Steel
- Steel

Environments

Components in the Keowee Governor Air System are exposed to the following environments:

- Air – Indoor Uncontrolled
- Condensation
- Raw Water
- Waste Water

Aging Effects Requiring Management

Components in the Keowee Governor Air System require aging management to address the following aging effects:

- Cracking
- Flow Blockage
- Long-Term Loss of Material
- Loss of Material
- Loss of Preload

Aging Management Programs

The aging effects for components in the Keowee Governor Air System are managed by the following AMPs:

- Bolting Integrity (B2.1.9)
- External Surfaces Monitoring of Mechanical Components (B2.1.23)

* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)

3.3.2.1.8 Keowee Station Air System

Materials

Components in the Keowee Station Air System are constructed of the following materials:

* Stainless Steel
* Steel

Environments

Components in the Keowee Station Air System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Raw Water
* Waste Water

Aging Effects Requiring Management

Components in the Keowee Station Air System require aging management to address the following aging effects:

* Cracking
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Keowee Station Air System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)

* Open-Cycle Cooling Water System (B2.1.11)

3.3.2.1.9 Nitrogen Purge and Blanket System

Materials

Components in the Nitrogen Purge and Blanket System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Elastomer
* Stainless Steel
* Steel

Environments

Components in the Nitrogen Purge and Blanket System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Gas

Aging Effects Requiring Management

Components in the Nitrogen Purge and Blanket System require aging management to address the following aging effects:

* Cracking
* Hardening or Loss of Strength
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Nitrogen Purge and Blanket System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)

3.3.2.1.10 Service Air System

Materials

Components in the Service Air System are constructed of the following materials:

* Aluminum
* Copper Alloy
* Galvanized Steel
* Glass
* Stainless Steel
* Steel

Environments

Components in the Service Air System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Condensation
* Soil
* Waste Water

Aging Effects Requiring Management

Components in the Service Air System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Service Air System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Buried and Underground Piping and Tanks (B2.1.26)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)

3.3.2.1.11 Standby Shutdown Facility Fire Protection System

Materials

Components in the Standby Shutdown Facility Fire Protection System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Galvanized Steel
* Stainless Steel
* Steel

Environments

Components in the Standby Shutdown Facility Fire Protection System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Condensation
* Gas

Aging Effects Requiring Management

Components in the Standby Shutdown Facility Fire Protection System require aging management to address the following aging effects:

* Cracking
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Standby Shutdown Facility Fire Protection System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Fire Protection (B2.1.15)
* One-Time Inspection (B2.1.20)

3.3.2.1.12 Chemical Addition System

Materials

Components in the Chemical Addition System are constructed of the following materials:

* Aluminum
* Elastomer
* Glass
* Gray Cast Iron
* Polymeric
* Stainless Steel
* Steel

Environments

Components in the Chemical Addition System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Gas
* Treated Borated Water
* Treated Borated water >60°C (>140°F)
* Treated Water
* Treated Water >60°C (>140°F)
* Waste Water
* Waste Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Chemical Addition System require aging management to address the following aging effects:

* Cracking
* Cracking or Blistering
* Cumulative Fatigue Damage
* Hardening or Loss of Strength
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Chemical Addition System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)
* TLAA
* Water Chemistry (B2.1.2)

3.3.2.1.13 Coolant Storage System

Materials

Components in the Coolant Storage System are constructed of the following materials:

* Aluminum
* Glass
* Stainless Steel
* Steel

Environments

Components in the Coolant Storage System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Gas
* Treated Borated Water
* Treated Borated water >60°C (>140°F)
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Coolant Storage System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Coolant Storage System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* One-Time Inspection (B2.1.20)
* TLAA
* Water Chemistry (B2.1.2)

3.3.2.1.14 Coolant Treatment System

Materials

Components in the Coolant Treatment System are constructed of the following materials:

* Stainless Steel
* Steel

Environments

Components in the Coolant Treatment System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Gas
* Treated Water
* Treated Water >60°C (>140°F)
* Waste Water
* Waste Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Coolant Treatment System require aging management to address the following aging effects:

* Cracking
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Coolant Treatment System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

* Boric Acid Corrosion (B2.1.4)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Water Chemistry (B2.1.2)

3.3.2.1.15 Demineralized Water System

Materials

Components in the Demineralized Water System are constructed of the following materials:

* Aluminum
* Copper Alloy (>15% Zn)
* PVC
* Stainless Steel
* Steel

Environments

Components in the Demineralized Water System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Demineralized Water System require aging management to address the following aging effects:

* Cracking
* Cracking or Blistering
* Hardening or Loss of Strength
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Demineralized Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)
* Water Chemistry (B2.1.2)

3.3.2.1.16 Essential Siphon Vacuum System

Materials

Components in the Essential Siphon Vacuum System are constructed of the following materials:

- Gray Cast Iron
- Stainless Steel
- Steel

Environments

Components in the Essential Siphon Vacuum System are exposed to the following environments:

- Air
- Air – Indoor Uncontrolled
- Raw Water
- Soil
- Underground

Aging Effects Requiring Management

Components in the Essential Siphon Vacuum System require aging management to address the following aging effects:

- Cracking
- Loss of Material
- Loss of Preload

Aging Management Programs

The aging effects for components in the Essential Siphon Vacuum System are managed by the following AMPs:

- Bolting Integrity (B2.1.9)

* Buried and Underground Piping and Tanks (B2.1.26)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)

3.3.2.1.17 Spent Fuel Cooling System

Materials

Components in the Spent Fuel Cooling System are constructed of the following materials:

* Elastomer
* Glass
* Polymeric
* Stainless Steel
* Steel

Environments

Components in the Spent Fuel Cooling System are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Closed-Cycle Cooling Water >60°C (>140°F)
* Treated Borated Water
* Treated Borated water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Spent Fuel Cooling System require aging management to address the following aging effects:

* Cracking
* Cracking or Blistering
* Hardening or Loss of Strength
* Loss of Material
* Loss of Preload

* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Spent Fuel Cooling System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Water Chemistry (B2.1.2)

3.3.2.1.18 Alternate Chilled Water System

Materials

Components in the Alternate Chilled Water System are constructed of the following materials:

* Aluminum
* Copper Alloy
* Copper Alloy (>15% Zn)
* Ductile Iron
* Elastomer
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Alternate Chilled Water System are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air – Outdoor
* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Gas
* Raw Water (Potable)

Aging Effects Requiring Management

Components in the Alternate Chilled Water System require aging management to address the following aging effects:

* Cracking

* Hardening or Loss of Strength
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Alternate Chilled Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)

3.3.2.1.19 Component Cooling Water System

Materials

Components in the Component Cooling Water System are constructed of the following materials:

* Glass
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Component Cooling Water System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Closed-Cycle Cooling Water >60°C (>140°F)
* Raw Water

Aging Effects Requiring Management

Components in the Component Cooling Water System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Component Cooling Water System are managed by the following AMPs:

- Bolting Integrity (B2.1.9)
- Boric Acid Corrosion (B2.1.4)
- Closed Treated Water System (B2.1.12)
- External Surfaces Monitoring of Mechanical Components (B2.1.23)
- One-Time Inspection (B2.1.20)
- Open-Cycle Cooling Water System (B2.1.11)
- Selective Leaching (B2.1.21)
- TLAA

3.3.2.1.20 Chilled Water (Non-Vital Loads) System

Materials

Components in the Chilled Water (Non-Vital Loads) System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Glass
* Stainless Steel
* Steel

Environments

Components in the Chilled Water (Non-Vital Loads) System are exposed to the following environments:

* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Condensation
* Gas
* Raw Water

Aging Effects Requiring Management

Components in the Chilled Water (Non-Vital Loads) System require aging management to address the following aging effects:

* Cracking
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Chilled Water (Non-Vital Loads) System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)

3.3.2.1.21 Recirculating Cooling Water System

Materials

Components in the Recirculating Cooling Water System are constructed of the following materials:

* Copper Alloy (>15% Zn)
* Glass
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Recirculating Cooling Water System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Closed-Cycle Cooling Water >60°C (>140°F)
* Gas
* Raw Water

Aging Effects Requiring Management

Components in the Recirculating Cooling Water System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Recirculating Cooling Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)

3.3.2.1.22 Sample Cooling Water System

Materials

Components in the Sample Cooling Water System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Sample Cooling Water System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Closed-Cycle Cooling Water
* Gas
* Raw Water (Potable)

Aging Effects Requiring Management

Components in the Sample Cooling Water System require aging management to address the following aging effects:

* Cracking
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Sample Cooling Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)

3.3.2.1.23 Chilled Water (Vital Loads) System

Materials

Components in the Chilled Water (Vital Loads) System are constructed of the following materials:

* Aluminum
* Copper Alloy
* Glass
* Gray Cast Iron
* Polymeric
* Stainless Steel
* Steel

Environments

Components in the Chilled Water (Vital Loads) System are exposed to the following environments:

* Air – Outdoor
* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Condensation
* Gas
* Raw Water

Aging Effects Requiring Management

Components in the Chilled Water (Vital Loads) System require aging management to address the following aging effects:

* Cracking
* Cracking or Blistering
* Flow Blockage

* Hardening or Loss of Strength
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Chilled Water (Vital Loads) System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)

3.3.2.1.24 High Pressure Service Water System

Materials

Components in the High Pressure Service Water System are constructed of the following materials:

* Aluminum
* Copper Alloy
* Copper Alloy (>15% Zn)
* Ductile Iron
* Ductile Iron (w. Cement Lining)
* Elastomer
* Galvanized Steel
* Gray Cast Iron
* Stainless Steel
* Steel
* Steel with Internal Coating/Lining

Environments

Components in the High Pressure Service Water System are exposed to the following environments:

* Air – Outdoor
* Air with Borated Water Leakage
* Condensation
* Raw Water
* Soil
* Underground

Aging Effects Requiring Management

Components in the High Pressure Service Water System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Hardening or Loss of Strength
* Long-Term Loss of Material
* Loss of Coating or Lining Integrity
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the High Pressure Service Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Buried and Underground Piping and Tanks (B2.1.26)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Fire Water System (B2.1.16)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)

3.3.2.1.25 Keowee Service Water System

Materials

Components in the Keowee Service Water System are constructed of the following materials:

* Copper Alloy
* Galvanized Steel
* Gray Cast Iron
* Polymeric
* PVC
* Stainless Steel
* Steel

Environments

Components in the Keowee Service Water System are exposed to the following environments:

* Condensation
* Raw Water

Aging Effects Requiring Management

Components in the Keowee Service Water System require aging management to address the following aging effects:

* Cracking
* Cracking or Blistering
* Cracking, Blistering
* Hardening or Loss of Strength
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Keowee Service Water System are managed by the following AMPs:

- Bolting Integrity (B2.1.9)
- External Surfaces Monitoring of Mechanical Components (B2.1.23)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
- One-Time Inspection (B2.1.20)
- Open-Cycle Cooling Water System (B2.1.11)
- Selective Leaching (B2.1.21)

3.3.2.1.26 Keowee Fire Detection/Protection System

Materials

Components in the Keowee Fire Detection/Protection System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Ductile Iron
* Ductile Iron (w. Cement Lining)
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Keowee Fire Detection/Protection System are exposed to the following environments:

* Air – Outdoor
* Condensation
* Raw Water
* Soil

Aging Effects Requiring Management

Components in the Keowee Fire Detection/Protection System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Long-Term Loss of Material
* Loss of Coating or Lining Integrity
* Loss of Material

* Loss of Preload

Aging Management Programs

The aging effects for components in the Keowee Fire Detection/Protection System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Buried and Underground Piping and Tanks (B2.1.26)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Fire Water System (B2.1.16)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)

3.3.2.1.27 Reactor Building Cooling and Ventilation Systems

Materials

Components in the Reactor Building Cooling and Ventilation Systems are constructed of the following materials:

* Copper Alloy
* Galvanized Steel
* Stainless Steel
* Steel

Environments

Components in the Reactor Building Cooling and Ventilation Systems are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Condensation
* Raw Water
* Waste Water

Aging Effects Requiring Management

Components in the Reactor Building Cooling and Ventilation Systems require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Reactor Building Cooling and Ventilation Systems are managed by the following AMPs:

* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)

3.3.2.1.28 Reactor Building Purge System

Materials

Components in the Reactor Building Purge System are constructed of the following materials:

* Copper Alloy
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Reactor Building Purge System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Treated Water
* Waste Water
* Waste Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Reactor Building Purge System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Reactor Building Purge System are managed by the following AMPs:

* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)
* Water Chemistry (B2.1.2)

3.3.2.1.29 Ventilation Systems

Materials

Components in the Ventilation Systems are constructed of the following materials:

* Aluminum
* Copper Alloy
* Elastomer
* Galvanized Steel
* Galvanized Steel with Internal Coating/Lining
* Gray Cast Iron
* Polymeric
* PVC
* Stainless Steel
* Steel

Environments

Components in the Ventilation Systems are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Condensation
* Gas
* Raw Water
* Treated Water
* Waste Water

Aging Effects Requiring Management

Components in the Ventilation Systems require aging management to address the following aging effects:

* Cracking
* Cracking or Blistering
* Flow Blockage
* Hardening or Loss of Strength
* Long-Term Loss of Material
* Loss of Coating or Lining Integrity
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Ventilation Systems are managed by the following AMPs:

* Boric Acid Corrosion (B2.1.4)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Fire Protection (B2.1.15)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)
* Water Chemistry (B2.1.2)

3.3.2.1.30 Lube Oil System

Materials

Components in the Lube Oil System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Elastomer
* Glass
* Gray Cast Iron
* Stainless Steel
* Steel
* Steel with Internal Coating/Lining

Environments

Components in the Lube Oil System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Closed-Cycle Cooling Water
* Lubricating Oil
* Raw Water
* Waste Water
* Waste Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Lube Oil System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Hardening or Loss of Strength

* Long-Term Loss of Material
* Loss of Coating or Lining Integrity
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Lube Oil System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)
* Lubricating Oil Analysis (B2.1.25)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)

3.3.2.1.31 Keowee Turbine Guide Bearing Oil System

Materials

Components in the Keowee Turbine Guide Bearing Oil System are constructed of the following materials:

- Copper Alloy (>15% Zn)
- Stainless Steel
- Steel

Environments

Components in the Keowee Turbine Guide Bearing Oil System are exposed to the following environments:

- Air – Indoor Uncontrolled
- Lubricating Oil
- Raw Water

Aging Effects Requiring Management

Components in the Keowee Turbine Guide Bearing Oil System require aging management to address the following aging effects:

- Cracking
- Flow Blockage
- Loss of Material
- Loss of Preload
- Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Keowee Turbine Guide Bearing Oil System are managed by the following AMPs:

- Bolting Integrity (B2.1.9)

* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Lubricating Oil Analysis (B2.1.25)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)

3.3.2.1.32 Keowee Lube Oil System

Materials

Components in the Keowee Lube Oil System are constructed of the following materials:

* Copper Alloy (>15% Zn)
* Glass
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Keowee Lube Oil System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Lubricating Oil
* Waste Water

Aging Effects Requiring Management

Components in the Keowee Lube Oil System require aging management to address the following aging effects:

* Cracking
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Keowee Lube Oil System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* Lubricating Oil Analysis (B2.1.25)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)

3.3.2.1.33 Filtered Water System

Materials

Components in the Filtered Water System are constructed of the following materials:

* Aluminum
* Stainless Steel
* Steel

Environments

Components in the Filtered Water System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Raw Water (Potable)

Aging Effects Requiring Management

Components in the Filtered Water System require aging management to address the following aging effects:

* Cracking
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Filtered Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)

3.3.2.1.34 Keowee Main Turbine System

Materials

Components in the Keowee Main Turbine System are constructed of the following materials:

* Stainless Steel
* Steel

Environments

Components in the Keowee Main Turbine System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Concrete
* Raw Water

Aging Effects Requiring Management

Components in the Keowee Main Turbine System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Keowee Main Turbine System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)

3.3.2.1.35 Leak Rate Test System

Materials

Components in the Leak Rate Test System are constructed of the following materials:

* Copper Alloy
* Galvanized Steel
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Leak Rate Test System are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air – Outdoor
* Air with Borated Water Leakage

Aging Effects Requiring Management

Components in the Leak Rate Test System require aging management to address the following aging effects:

* Cracking
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Leak Rate Test System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)

3.3.2.1.36 Plant Drinking Water System

Materials

Components in the Plant Drinking Water System are constructed of the following materials:

* Copper Alloy
* Galvanized Steel
* Glass
* Polymeric
* PVC
* Stainless Steel
* Steel
* Steel with Internal Coating/Lining

Environments

Components in the Plant Drinking Water System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Raw Water
* Raw Water (Potable)
* Raw Water >60°C (>140°F) (Potable)

Aging Effects Requiring Management

Components in the Plant Drinking Water System require aging management to address the following aging effects:

* Cracking
* Cracking or Blistering
* Hardening or Loss of Strength
* Long-Term Loss of Material

* Loss of Coating or Lining Integrity
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Plant Drinking Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)

3.3.2.1.37 Radiation Monitoring System

Materials

Components in the Radiation Monitoring System are constructed of the following materials:

* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Radiation Monitoring System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Raw Water
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Radiation Monitoring System require aging management to address the following aging effects:

* Cracking
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Radiation Monitoring System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)
* Water Chemistry (B2.1.2)

3.3.2.1.38 Stator Coolant System

Materials

Components in the Stator Coolant System are constructed of the following materials:

* Copper Alloy
* Stainless Steel
* Steel

Environments

Components in the Stator Coolant System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Stator Coolant System require aging management to address the following aging effects:

* Cracking
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Stator Coolant System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* One-Time Inspection (B2.1.20)

* Water Chemistry (B2.1.2)

3.3.2.1.39 Station Sewage Disposal System

Materials

Components in the Station Sewage Disposal System are constructed of the following materials:

* Galvanized Steel
* Gray Cast Iron
* Polymeric
* PVC
* Stainless Steel
* Steel

Environments

Components in the Station Sewage Disposal System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Waste Water
* Waste Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Station Sewage Disposal System require aging management to address the following aging effects:

* Cracking
* Cracking or Blistering
* Hardening or Loss of Strength
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Station Sewage Disposal System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)

3.3.2.1.40 Keowee Turbine Sump Pump System

Materials

Components in the Keowee Turbine Sump Pump System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Keowee Turbine Sump Pump System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Concrete
* Waste Water

Aging Effects Requiring Management

Components in the Keowee Turbine Sump Pump System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Keowee Turbine Sump Pump System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)

3.3.2.1.41 Vacuum System

Materials

Components in the Vacuum System are constructed of the following materials:

* Copper Alloy
* Ductile Iron
* Glass
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Vacuum System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Condensation
* Raw Water
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Vacuum System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Vacuum System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)
* TLAA
* Water Chemistry (B2.1.2)

3.3.2.1.42 Electro-Hydraulic Control System

Materials

Components in the Electro-Hydraulic Control System are constructed of the following materials:

* Aluminum
* Ductile Iron
* Elastomer
* Glass
* Stainless Steel
* Steel

Environments

Components in the Electro-Hydraulic Control System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Closed-Cycle Cooling Water
* Gas
* Lubricating Oil

Aging Effects Requiring Management

Components in the Electro-Hydraulic Control System require aging management to address the following aging effects:

* Cracking
* Hardening or Loss of Strength
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Electro-Hydraulic Control System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* Lubricating Oil Analysis (B2.1.25)
* One-Time Inspection (B2.1.20)

3.3.2.1.43 Fuel Oil System

Materials

Components in the Fuel Oil System are constructed of the following materials:

* Polymeric
* Stainless Steel
* Steel

Environments

Components in the Fuel Oil System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Fuel Oil
* Lubricating Oil (Waste Oil)

Aging Effects Requiring Management

Components in the Fuel Oil System require aging management to address the following aging effects:

* Cracking
* Cracking or Blistering
* Hardening or Loss of Strength
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Fuel Oil System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)

* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)

3.3.2.1.44 Keowee Generator High Pressure Oil System

Materials

Components in the Keowee Generator High Pressure Oil System are constructed of the following materials:

* Copper Alloy
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Keowee Generator High Pressure Oil System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Lubricating Oil

Aging Effects Requiring Management

Components in the Keowee Generator High Pressure Oil System require aging management to address the following aging effects:

* Cracking
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Keowee Generator High Pressure Oil System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Lubricating Oil Analysis (B2.1.25)

* One-Time Inspection (B2.1.20)

3.3.2.1.45 Keowee Governor Oil System

Materials

Components in the Keowee Governor Oil System are constructed of the following materials:

* Glass
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Keowee Governor Oil System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Lubricating Oil

Aging Effects Requiring Management

Components in the Keowee Governor Oil System require aging management to address the following aging effects:

* Cracking
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Keowee Governor Oil System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Lubricating Oil Analysis (B2.1.25)
* One-Time Inspection (B2.1.20)

3.3.2.1.46 Refueling System

Materials

Components in the Refueling System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Elastomer
* Glass
* Stainless Steel
* Steel

Environments

Components in the Refueling System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Treated Water

Aging Effects Requiring Management

Components in the Refueling System require aging management to address the following aging effects:

* Cracking
* Hardening or Loss of Strength
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Refueling System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)
* Water Chemistry (B2.1.2)

3.3.2.1.47 Hydrogen Seal Oil System

Materials

Components in the Hydrogen Seal Oil System are constructed of the following materials:

* Copper Alloy
* Ductile Iron
* Glass
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Hydrogen Seal Oil System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Lubricating Oil

Aging Effects Requiring Management

Components in the Hydrogen Seal Oil System require aging management to address the following aging effects:

* Cracking
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Hydrogen Seal Oil System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)

* Lubricating Oil Analysis (B2.1.25)
* One-Time Inspection (B2.1.20)

3.3.2.1.48 Condenser Circulating Water System

Materials

Components in the Condenser Circulating Water System are constructed of the following materials:

* Copper Alloy
* Ductile Iron
* Elastomer
* Gray Cast Iron
* Stainless Steel
* Steel
* Steel with Internal Coating/Lining

Environments

Components in the Condenser Circulating Water System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Air with Borated Water Leakage
* Concrete
* Condensation
* Gas
* Raw Water
* Soil
* Underground
* Waste Water

Aging Effects Requiring Management

Components in the Condenser Circulating Water System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Flow Blockage
* Hardening or Loss of Strength
* Long-Term Loss of Material
* Loss of Coating or Lining Integrity
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Condenser Circulating Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Buried and Underground Piping and Tanks (B2.1.26)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)
* TLAA

3.3.2.1.49 Low Pressure Service Water System

Materials

Components in the Low Pressure Service Water System are constructed of the following materials:

- Aluminum
- Copper Alloy
- Copper Alloy (>15% Zn)
- Ductile Iron
- Elastomer
- Glass
- Gray Cast Iron
- Stainless Steel
- Steel
- Steel with Internal Coating/Lining

Environments

Components in the Low Pressure Service Water System are exposed to the following environments:

- Air
- Air – Dry
- Air – Indoor Uncontrolled
- Air – Outdoor
- Air with Borated Water Leakage
- Concrete
- Condensation
- Raw Water

Aging Effects Requiring Management

Components in the Low Pressure Service Water System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Flow Blockage
* Hardening or Loss of Strength
* Long-Term Loss of Material
* Loss of Coating or Lining Integrity
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Low Pressure Service Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Compressed Air Monitoring (B2.1.14)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)
* TLAA

3.3.2.1.50 Protected Service Water System

Materials

Components in the Protected Service Water System are constructed of the following materials:

* Ductile Iron
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Protected Service Water System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Concrete
* Raw Water
* Waste Water

Aging Effects Requiring Management

Components in the Protected Service Water System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Protected Service Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)

3.3.2.1.51 Siphon Seal Water System

Materials

Components in the Siphon Seal Water System are constructed of the following materials:

* Stainless Steel
* Steel

Environments

Components in the Siphon Seal Water System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Condensation
* Raw Water
* Soil
* Underground

Aging Effects Requiring Management

Components in the Siphon Seal Water System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Siphon Seal Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

* Buried and Underground Piping and Tanks (B2.1.26)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)

3.3.2.1.52 Keowee Turbine Generator Cooling Water System

Materials

Components in the Keowee Turbine Generator Cooling Water System are constructed of the following materials:

- Copper Alloy
- Copper Alloy (>15% Zn)
- Copper Alloy (>8% Al)
- Gray Cast Iron
- Stainless Steel
- Steel

Environments

Components in the Keowee Turbine Generator Cooling Water System are exposed to the following environments:

- Air – Indoor Uncontrolled
- Concrete
- Raw Water

Aging Effects Requiring Management

Components in the Keowee Turbine Generator Cooling Water System require aging management to address the following aging effects:

- Cracking
- Flow Blockage
- Long-Term Loss of Material
- Loss of Material
- Loss of Preload
- Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Keowee Turbine Generator Cooling Water System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)

3.3.2.1.53 Standby Shutdown Facility Air Intake and Exhaust System

Materials

Components in the Standby Shutdown Facility Air Intake and Exhaust System are constructed of the following materials:

* Calcium Silicate
* Elastomer
* Stainless Steel
* Steel

Environments

Components in the Standby Shutdown Facility Air Intake and Exhaust System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Diesel Exhaust

Aging Effects Requiring Management

Components in the Standby Shutdown Facility Air Intake and Exhaust System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Hardening or Loss of Strength
* Loss of Material
* Loss of Preload
* Reduced Thermal Insulation Resistance

Aging Management Programs

The aging effects for components in the Standby Shutdown Facility Air Intake and Exhaust System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* TLAA

3.3.2.1.54 Standby Shutdown Facility Diesel Jacket Water Cooling System

Materials

Components in the Standby Shutdown Facility Diesel Jacket Water Cooling System are constructed of the following materials:

* Copper Alloy (>15% Zn)
* Glass
* Stainless Steel
* Steel

Environments

Components in the Standby Shutdown Facility Diesel Jacket Water Cooling System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Closed-Cycle Cooling Water
* Closed-Cycle Cooling Water >60°C (>140°F)
* Raw Water

Aging Effects Requiring Management

Components in the Standby Shutdown Facility Diesel Jacket Water Cooling System require aging management to address the following aging effects:

* Cracking
* Flow Blockage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Standby Shutdown Facility Diesel Jacket Water Cooling System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)

3.3.2.1.55 Standby Shutdown Facility Diesel Lube Oil System

Materials

Components in the Standby Shutdown Facility Diesel Lube Oil System are constructed of the following materials:

* Aluminum
* Copper Alloy (>15% Zn)
* Glass
* Stainless Steel
* Steel

Environments

Components in the Standby Shutdown Facility Diesel Lube Oil System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Closed-Cycle Cooling Water
* Lubricating Oil

Aging Effects Requiring Management

Components in the Standby Shutdown Facility Diesel Lube Oil System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer

Aging Management Programs

The aging effects for components in the Standby Shutdown Facility Diesel Lube Oil System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Lubricating Oil Analysis (B2.1.25)
* One-Time Inspection (B2.1.20)
* TLAA

3.3.2.1.56 Standby Shutdown Facility Fuel Oil System

Materials

Components in the Standby Shutdown Facility Fuel Oil System are constructed of the following materials:

* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Standby Shutdown Facility Fuel Oil System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Concrete
* Fuel Oil
* Soil
* Underground

Aging Effects Requiring Management

Components in the Standby Shutdown Facility Fuel Oil System require aging management to address the following aging effects:

* Cracking
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Standby Shutdown Facility Fuel Oil System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Buried and Underground Piping and Tanks (B2.1.26)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Fuel Oil Chemistry (B2.1.18)
* One-Time Inspection (B2.1.20)

3.3.2.1.57 Standby Shutdown Facility Starting Air System

Materials

Components in the Standby Shutdown Facility Starting Air System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Ductile Iron
* Elastomer
* Stainless Steel
* Steel
* Zinc

Environments

Components in the Standby Shutdown Facility Starting Air System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Condensation

Aging Effects Requiring Management

Components in the Standby Shutdown Facility Starting Air System require aging management to address the following aging effects:

* Cracking
* Hardening or Loss of Strength
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Standby Shutdown Facility Starting Air System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)

3.3.2.1.58 Gaseous Waste Disposal System

Materials

Components in the Gaseous Waste Disposal System are constructed of the following materials:

* Glass
* Nickel Alloy
* Stainless Steel
* Steel

Environments

Components in the Gaseous Waste Disposal System are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Gas
* Treated Water
* Treated Water >60°C (>140°F)
* Waste Water

Aging Effects Requiring Management

Components in the Gaseous Waste Disposal System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material

* Loss of Preload

Aging Management Programs

The aging effects for components in the Gaseous Waste Disposal System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* TLAA
* Water Chemistry (B2.1.2)

3.3.2.1.59 Liquid Waste Disposal System

Materials

Components in the Liquid Waste Disposal System are constructed of the following materials:

* Copper Alloy
* Glass
* Stainless Steel
* Steel
* Steel (with Stainless Steel Cladding)

Environments

Components in the Liquid Waste Disposal System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Concrete
* Waste Water
* Waste Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Liquid Waste Disposal System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Flow Blockage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Liquid Waste Disposal System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* TLAA

3.3.2.2 Further Evaluation of Aging Management as Recommended by NUREG-2192

NUREG-2192 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the SLRA. For the auxiliary systems, those evaluations are addressed in the following sections. Italicized text is taken directly from NUREG-2192.

3.3.2.2.1 Cumulative Fatigue Damage

NUREG-2192:

Evaluations involving time-dependent fatigue or cyclical loading parameters may be time-limited aging analyses (TLAAs), as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). This TLAA is addressed separately in Section 4.3, “Metal Fatigue,” or Section 4.7, “Other Plant-Specific Time-Limited Aging Analyses,” of this SRP-SLR. For plant-specific cumulative usage factor calculations that are based on stress-based input methods, the methods are to be appropriately defined and discussed in the applicable TLAAs.

Evaluation:

[3.3.1-001] - Load cycles of NUREG-0612 plant cranes is a TLAA as defined in 10 CFR 54.3. The evaluation of the TLAA is addressed in Section 4.7.5, Crane Load Cycle Limit.

[3.3.1-002] - Fatigue of auxiliary systems components is a TLAA as defined in 10 CFR 54.3. The evaluation of the TLAA is address in Section 4.3.3, Non-Class 1 Piping Fatigue Analyses.

3.3.2.2.2 Cracking Due to Stress Corrosion Cracking and Cyclic Loading

Cracking due to stress corrosion cracking (SCC) and cyclic loading could occur in stainless steel (SS) PWR nonregenerative heat exchanger tubing exposed to treated borated water greater than 60 ^{o}C (Celsius) [140 ^{o}F (Fahrenheit)] in the chemical and volume control system. The existing AMP for monitoring and control of primary water chemistry in PWRs (GALL-SLR Report AMP X1.M2, “Water Chemistry”) manages the aging effects of cracking due to SCC. However, control of water chemistry does not preclude cracking due to SCC and cyclic loading. Therefore, the effectiveness of the water chemistry control program should be verified to ensure that cracking is not occurring. If a search of plant-specific operating experience (OE) does not reveal that cracking has occurred in nonregenerative heat exchanger tubing, this aging effect can be considered to be adequately managed by GALL-SLR Report AMP XI.M2. However, if cracking has occurred in nonregenerative heat exchanger tubing, the GALL-SLR Report recommends that AMP XI.M21A, “Closed Treated Water Systems,” be evaluated for inclusion of augmented requirements to conduct temperature and radioactivity monitoring of the shell side water, and where component configuration permits, periodic eddy current testing of tubes.

Evaluation:

[3.3.1-003] [3.3.1-003a] – Not applicable. The ONS high pressure injection system letdown coolers and seal return coolers function as nonregenerative heat exchangers. The tubes on these heat exchangers perform no intended function and are not in the scope of SLR. Therefore, cracking due to stress corrosion cracking and cyclic loading of stainless steel PWR nonregenerative heat exchanger tubing exposed to treated borated water greater than 60 °C (Celsius) [140 °F (Fahrenheit)] is not an aging effect requiring management for ONS.

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

NUREG-2192:

Cracking due to SCC could occur in indoor or outdoor SS piping, piping components, and tanks exposed to any air, condensation, or underground environment when the component is: (a) uninsulated, (b) insulated, (c) in the vicinity of insulated components, or (d) in the vicinity of potentially transportable halogens. Cracking can occur in environments containing sufficient halides (e.g., chlorides) in the presence of moisture.

Insulated SS components exposed to indoor air, outdoor air, condensation, or underground environments are susceptible to SCC if the insulation contains certain contaminants. Leakage of fluids through bolted connections (e.g., flanges, valve packing) can result in contaminants present in the insulation leaching onto the component surface or the surfaces of other components below the component. For outdoor insulated SS components, rain and changing weather conditions can result in moisture intrusion into the insulation.

Plant-specific OE and the condition of SS components are evaluated to determine if prolonged exposure to the plant-specific environments has resulted in SCC. SCC in SS components is not an aging effect requiring management if (a) plant-specific OE does not reveal a history of SCC and (b) a one-time inspection demonstrates that the aging effect is not occurring.

In the environment of air-indoor controlled, SCC is only expected to occur as the result of a source of moisture and halides. Inspections focus on the most susceptible locations. The applicant documents the results of the plant-specific OE review in the license renewal application (LRA).

The GALL-SLR Report recommends further evaluation of SS piping, piping components, and tanks exposed to an air, condensation, or underground environment to determine whether an AMP is needed to manage the aging effect of SCC. The GALL-SLR Report AMP XI.M32, "One-Time Inspection," describes an acceptable program to demonstrate that SCC is not occurring. If SCC is applicable, the following AMPs describe acceptable programs to manage loss of material due to SCC: (a) GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," for tanks; (b) GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," for external surfaces of piping and piping components; (c) GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," for underground piping, piping components and tanks; and (d) GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces *in Miscellaneous Piping and Ducting Components," for internal surfaces of components that are not included in other AMPs. The timing of the one-time or periodic inspections is consistent with that recommended in the AMP selected by the applicant during the development of the SLRA. For example, one-time inspections would be conducted between the 50th and 60th year of operation, as recommended by the "detection of aging effects" program element in GALL-SLR Report AMP XI.M32.*

The applicant may establish that SCC is not an aging effect requiring management for all components, by demonstrating that a barrier coating isolates the component from aggressive environments. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. The GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," describes an acceptable program to manage the integrity of a barrier coating.

Evaluation:

A review of ONS operating experience confirmed that cracking due to stress corrosion cracking has not been identified in stainless steel piping, piping components, and tanks exposed to air, condensation, or underground environment in ONS auxiliary systems.

[3.3.1-004] - The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that cracking due to stress corrosion cracking is not occurring on stainless steel piping, piping components, and tanks exposed to air or condensation environments.

[3.3.1-094a] - The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that cracking due to stress corrosion cracking is not occurring on stainless steel ducting or ducting components exposed to air or condensation environments.

[3.3.1-146] - The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that cracking due to stress corrosion cracking is not occurring on stainless steel piping or piping components exposed to an underground environment.

[3.3.1-205] - The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that cracking due to stress corrosion cracking is not occurring on insulated stainless steel piping, piping components, and tanks exposed to air or condensation environments.

[3.3.1-231] - ONS has no stainless steel tanks within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks" in the scope of SLR in auxiliary systems.

3.3.2.2.4 Loss of Material Due to Pitting and Crevice Corrosion in Stainless Steel and Nickel Alloys

NUREG-2192:

Loss of material due to pitting and crevice corrosion could occur in indoor or outdoor SS and nickel alloy piping, piping components, and tanks exposed to any air, condensation, or underground environment when the component is: (a) uninsulated; (b) insulated; (c) in the vicinity of insulated components; or (d) in the vicinity of potentially transportable halogens. Loss of material due to pitting and crevice corrosion can occur on SS and nickel alloys in environments containing sufficient halides (e.g., chlorides) in the presence of moisture.

Insulated SS and nickel alloy components exposed to air, condensation, or underground environments are susceptible to loss of material due to pitting or crevice corrosion if the insulation contains certain contaminants. Leakage of fluids through mechanical connections such as bolted flanges and valve packing can result in contaminants leaching onto the component surface or the surfaces of other components below the component. For outdoor insulated SS and nickel alloy components, rain and changing weather conditions can result in moisture intrusion into the insulation.

Plant-specific OE and the condition of SS and nickel alloy components are evaluated to determine if prolonged exposure to the plant-specific environments has resulted in pitting or crevice corrosion. Loss of material due to pitting and crevice corrosion is not an aging effect requiring management for SS and nickel alloy components if (a) plant-specific OE does not reveal a history of loss of material due to pitting or crevice corrosion; and (b) a one-time inspection demonstrates that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the subsequent period of extended operation. The applicant documents the results of the plant-specific OE review in the SLRA.

In the environment of air-indoor controlled, pitting and crevice corrosion is only expected to occur as the result of a source of moisture and halides. Inspections focus on the most susceptible locations.

The GALL-SLR Report recommends further evaluation of SS and nickel alloy piping, piping components, and tanks exposed to an air, condensation, or underground environment to determine whether an AMP is needed to manage the aging effect of loss of material due to pitting and crevice corrosion. GALL-SLR Report AMP XI.M32, "One-Time Inspection," describes an acceptable program to demonstrate that loss of material due to pitting and crevice corrosion is not occurring at a rate that affects the intended function of the components. If loss of material due to pitting or crevice corrosion has occurred and is sufficient to potentially affect the intended function of an SSC, the following AMPs describe acceptable programs to manage loss of material due to pitting or crevice corrosion: (a) GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," for tanks; (b) GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," for external surfaces of piping and piping components; (c) GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," for underground piping, piping components and tanks; and (d) GALL-SLR Report AMP

XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," for internal surfaces of components that are not included in other AMPs. The timing of the one-time or periodic inspections is consistent with that recommended in the AMP selected by the applicant during the development of the SLRA. For example, one-time inspections would be conducted between the 50th and 60th year of operation, as recommended by the "detection of aging effects" program element in GALL-SLR Report AMP XI.M32.

The applicant may establish that loss of material due to pitting and crevice corrosion is not an aging effect requiring management by demonstrating that a barrier coating isolates the component from aggressive environments. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," describes an acceptable program to manage the integrity of a barrier coating.

Evaluation:

A review of ONS operating experience confirmed that pitting and crevice corrosion has not occurred on surfaces of stainless steel or nickel alloy piping, piping components, and tanks exposed to air, condensation, or underground environments in ONS auxiliary systems.

[3.3.1-006] – The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of stainless steel and nickel alloy piping and piping components exposed to air or condensation environments is not occurring.

[3.3.1-094] – The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of stainless steel ducting and ducting components exposed to air or condensation environments is not occurring.

[3.3.1-222] – The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of stainless steel tanks exposed to air or condensation environments is not occurring.

[3.3.1-228] – Not applicable. ONS has no stainless steel or nickel alloy tanks within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks" in the scope of SLR in auxiliary systems.

[3.3.1-232] – The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of insulated stainless steel piping and piping components exposed to air or condensation environments is not occurring.

[3.3.1-241] – The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of stainless steel heat exchanger components exposed to air or condensation environments is not occurring.

[3.3.1-246] – The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of stainless steel piping and piping components exposed to an underground environment is not occurring.

3.3.2.2.5 Quality Assurance for Aging Management of Non-Safety Related Components

NUREG-2192:

Acceptance criteria are described in Branch Technical Position (BTP) IQMB-1 (Appendix A.2 of this SRP-SLR).

Evaluation:

Quality Assurance provisions applicable to SLR are discussed in Appendix B1.3, Quality Assurance Program and Administrative Controls.

3.3.2.2.6 Ongoing Review of Operating Experience

NUREG-2192:

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

Evaluation:

The OE process and acceptance criteria are described in Appendix B1.4, Operating Experience.

3.3.2.2.7 Loss of Material Due to Recurring Internal Corrosion

NUREG-2192:

Recurring internal corrosion can result in the need to augment AMPs beyond the recommendations in the GALL-SLR Report. During the search of plant-specific OE conducted during the SLRA development, recurring internal corrosion can be identified by the number of occurrences of aging effects and the extent of degradation at each localized corrosion site. This further evaluation item is applicable if the search of plant specific OE reveals repetitive occurrences. The criteria for recurrence is (a) a 10 year search of plant specific OE reveals the aging effect has occurred in three or more refueling outage cycles; or (b) a 5 year search of plant specific OE reveals the aging effect has occurred in two or more refueling outage cycles and resulted in the component either not meeting plant specific acceptance criteria or experiencing a reduction in wall thickness greater than 50 percent (regardless of the minimum wall thickness).

The GALL-SLR Report recommends that GALL-SLR Report AMP XI.M20, "Open-Cycle Cooling Water System," GALL-SLR Report AMP XI.M27, "Fire Water System," or GALL-SLR Report

AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," be evaluated for inclusion of augmented requirements to ensure the adequate management of any recurring aging effect(s). Alternatively, a plant-specific AMP may be proposed. Potential augmented requirements include: alternative examination methods (e.g., volumetric versus external visual), augmented inspections (e.g., a greater number of locations, additional locations based on risk insights based on susceptibility to aging effect and consequences of failure, a greater frequency of inspections), and additional trending parameters and decision points where increased inspections would be implemented.

The applicant states: (a) why the program's examination methods will be sufficient to detect the recurring aging effect before affecting the ability of a component to perform its intended function, (b) the basis for the adequacy of augmented or lack of augmented inspections, (c) what parameters will be trended as well as the decision points where increased inspections would be implemented (e.g., the extent of degradation at individual corrosion sites, the rate of degradation change), (d) how inspections of components that are not easily accessed (i.e., buried, underground) will be conducted, and (e) how leaks in any involved buried or underground components will be identified.

Plant-specific OE examples should be evaluated to determine if the chosen AMP should be augmented even if the thresholds for significance of aging effect or frequency of occurrence of aging effect have not been exceeded. For example, during a 10-year search of plant-specific OE, two instances of 360 degree 30 percent wall loss occurred at copper alloy to steel joints. Neither the significance of the aging effect nor the frequency of occurrence of aging effect threshold has been exceeded. Nevertheless, the OE should be evaluated to determine if the AMP that is proposed to manage the aging effect is sufficient (e.g., method of inspection, frequency of inspection, number of inspections) to provide reasonable assurance that the current licensing basis (CLB) intended functions of the component will be met throughout the subsequent period of extended operation. While recurring internal corrosion is not as likely in other environments as raw water and waste water (e.g., treated water), the aging effect should be addressed in a similar manner.

Evaluation:

[3.3.1-127] - The review of plant specific OE has identified recurring internal corrosion in carbon steel piping and piping components exposed to raw water from Lake Keowee. Carbon steel piping and piping components in the condenser circulating water system, high pressure service water system, Keowee fire protection/detection system, Keowee main turbine system, Keowee service water system, Keowee turbine generator cooling water system, low pressure service water system, protected service water system, and vacuum system are exposed to raw water from Lake Keowee and considered susceptible to recurring internal corrosion.

As described below ONS will implement the *Open-Cycle Cooling Water System* (B2.1.11) program to manage recurring internal corrosion. Deficiencies will be documented in accordance with 10 CFR Part 50, Appendix B corrective action program. *The Open-Cycle Cooling Water System* (B2.1.11) program is described in Appendix B.

a. The program utilizes volumetric (e.g., UT) examination methods for the detection of aging effects. The program will also rely on periodic internal visual inspections of the normally inaccessible (i.e., buried) condenser circulating water system piping. These conventional NDE methods quantitatively evaluate components to verify fitness for service and have been proven effective for the detection of aging effects prior to loss of intended function.

b. The program includes methodology for choosing piping inspection locations and the performance of volumetric inspections for various degradation mechanisms including recurring internal corrosion. The existing program does not require a specified number or location of volumetric examinations of raw water system piping. Instead, the number and prioritization of inspection locations is based on piping corrosion susceptibility (based on material, piping size, piping configuration, flow velocity, and past inspection data) and the consequences of pipe leaks or other integrity issues (e.g., piping design function). The size of the inspection scope and criteria used when selecting inspection locations may include: inspections required for extent of condition, re-inspection locations based on remaining service life calculations, new inspection locations based on Industry/Duke Energy fleet OE, and follow-up inspections of locations where repairs have been performed. The selection of inspection locations based on susceptibility to aging effects and consequences of failure is an acceptable approach to address recurring internal corrosion as required by this Further Evaluation. The *Open-Cycle Cooling Water System* (B2.1.11) program will be enhanced to require a minimum of 20 inspections for recurring internal corrosion every 24 months to ensure that a sufficient number of inspections are performed to adequately monitor the condition of carbon steel piping exposed to raw water from Lake Keowee at ONS. Inspections will be performed in both open-cycle cooling water systems and water-based fire suppression systems in representative sample locations with conditions that are characteristic of the conditions found throughout raw water filled systems at ONS. Since the material of construction and service environment are equivalent between the open-cycle cooling water systems and the water-based fire suppression systems, managing recurring internal corrosion of these systems as a single population is appropriate. Inspection results will be extrapolated to similar locations throughout all the raw water systems within the scope of SLR and used to assess the general condition of piping exposed to raw water, including carbon steel components exposed to raw water that are not easily accessed (i.e., buried). This characteristic-based approach recognizes the commonality among the component materials of construction and the environment to which they are exposed.

c. The program includes trending of corrosion data and the decision point where increased inspections would be implemented.

- The program includes guidance for the determination of the expected remaining service life based on the corrosion rate experienced by the inspected piping segment. To ensure conservatism, a safety factor of 1.5 - 2.0 is applied to the corrosion rate when calculating expected remaining service life. If the corrosion rate is based on a single set of data for the piping segment, then a safety factor of 2.0 is used to establish remaining service life. If there are multiple datasets for the piping, then a safety factor of 1.5 can be used.

- If the cause of the aging effect is not mitigated for all components constructed of the same material and exposed to the same environment, additional inspections are conducted if one of the inspections does not meet acceptance criteria. When the code (e.g., ASME Code Case N-513-3) requires extent of condition or scope expansion, the requirements of the code are followed. For extent of condition inspections that are not driven by code requirements, the *Open-Cycle Cooling Water System* (B2.1.11) program will be enhanced to provide for expanding inspection scope. The program will require no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination, whichever is less.

d. The only carbon steel components exposed to raw water that are not easily accessed (i.e., buried) is internally uncoated buried steel piping providing the supply and return flow paths to the radwaste equipment cooling system from the condenser circulating water system intake piping. The radwaste equipment cooling system does not perform any SLR intended functions and the supply and return lines are only in scope as part of the pressure boundary of the large diameter condenser circulating water system piping. The *Open-Cycle Cooling Water System* (B2.1.11) program will be enhanced to perform internal visual inspections of the visible portions of the radwaste equipment cooling system supply and return piping every six years in conjunction with the performance of the condenser circulating water system intake piping internal coating inspections. The direct visual inspections of this piping supplemented by the volumetric inspection data for the aboveground piping, which provides information regarding the general condition of similar piping exposed to the same service conditions, provide reasonable assurance that age-related degradation will be detected and corrected prior to loss of intended function.

e. ONS is incapable of detecting leaks in buried raw water piping during normal operation because installed instrumentation is not sensitive enough to detect leakage. However, the periodic internal visual inspections of the buried piping segments susceptible to recurring internal corrosion will provide opportunities to detect direct evidence of internal degradation and through wall leakage as well as indirect evidence of through wall leakage including the presence of backfill material or gravel within the pipe. Additionally, internal corrosion effects are similar for both buried and accessible piping. The *Open-Cycle Cooling Water System* (B2.1.11) program extrapolates the results of inspections to similar locations throughout all the raw water systems within the scope of SLR and to assess the general condition of piping exposed to raw water including both buried and accessible piping.

3.3.2.2.8 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

<u>NUREG-2192</u>

SCC is a form of environmentally assisted cracking which is known to occur in high and moderate strength aluminum alloys. The three conditions necessary for SCC to occur in a component are a sustained tensile stress, aggressive environment, and material with a susceptible microstructure. Cracking due to SCC can be mitigated by eliminating one of the three necessary conditions. For the purposes of SLR, acceptance criteria for this further evaluation is being provided for demonstrating that the specific material is not susceptible to SCC or an aggressive environment is not present. Cracking due to SCC is an aging effect requiring management unless it is demonstrated by the applicant that one of the two necessary conditions discussed below is absent.

Susceptible Material: If the material is not susceptible to SCC then cracking is not an aging effect requiring management. The microstructure of an aluminum alloy, of which alloy composition is only one factor, is what determines if the alloy is susceptible to SCC. Therefore, determining susceptibility based on alloy composition alone is not adequate to conclude whether a particular material is susceptible to SCC. The temper, condition, and product form of the alloy is considered when assessing if a material is susceptible to SCC. Aluminum alloys that are susceptible to SCC include:

- *2xxx series alloys in the F, W, Ox, T3x, T4x, or T6x temper*
- *5xxx series alloys with a magnesium content of 3.5 weight percent or greater*
- *6xxx series alloys in the F temper*
- *7xxx series alloys in the F, T5x, or T6x temper*
- *2xx.x and 7xx.x series alloys*
- *3xx.x series alloys that contain copper*
- *5xx.x series alloys with a magnesium content of greater than 8 weight percent*

The material is evaluated to verify that it is not susceptible to SCC and that the basis used to make the determination is technically substantiated. Tempers have been specifically developed to improve the SCC resistance for some aluminum alloys. Aluminum alloy and temper combination which are not susceptible to SCC when used in piping, piping component, and tank applications include 1xxx series, 3xxx series, 6061-T6x, and 5454-x. If it is determined that a material is not susceptible to SCC, the SLRA provides the components/locations where it is used, alloy composition, temper or condition, product form, and for tempers not addressed above, the basis used to determine the alloy is not susceptible and technical information substantiating the basis.

Aggressive Environment: If the environment to which an aluminum alloy is exposed is not aggressive, such as dry gas or treated water, then cracking due to SCC will not occur and it is not an aging effect requiring management. Aggressive environments that are known to result in cracking due to SCC of susceptible aluminum alloys are aqueous solutions, air, condensation, and underground locations that contain halides (e.g., chloride). Halide concentrations should be considered high enough to facilitate SCC of aluminum alloys in uncontrolled or untreated *aqueous solutions and air, such as raw water, waste water, condensation, underground locations, and outdoor air, unless demonstrated otherwise.*

Halides could be present on the surface of the aluminum material if the component is encapsulated in a material such as insulation or concrete. In a controlled or uncontrolled indoor air, condensation, or underground environment, sufficient halide concentrations to cause SCC could be present due to secondary sources such as leakage from nearby components (e.g., leakage from insulated flanged connections or valve packing). If an aluminum component is exposed to a halide-free indoor air environment, not encapsulated in materials containing halides, and the exposure to secondary sources of moisture or halides is precluded, cracking due to SCC is not expected to occur. The plant-specific configuration can be used to demonstrate that exposure to halides will not occur. If it is determined that SCC will not occur because the environment is not aggressive, the SLRA provides the components and locations exposed to the environment, a description of the environment, basis used to determine the environment is not aggressive, and technical information substantiating the basis. The GALL-SLR Report AMP XI.M32, "One-Time Inspection," and a review of plant-specific OE describe an acceptable means to confirm the absence of moisture or halides within the proximity of the aluminum component.

If the environment potentially contains halides, GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," describes an acceptable program to manage cracking due to SCC of aluminum tanks. GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," describes an acceptable program to manage cracking due to SCC of aluminum piping and piping components. GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," describes an acceptable program to manage cracking due to SCC of aluminum piping and tanks which are buried or underground. GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" describes an acceptable program to manage cracking due to SCC of aluminum components that are not included in other AMPs.

An alternative strategy to demonstrating that an aggressive environment is not present is to isolate the aluminum alloy from the environment using a barrier to prevent SCC. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," describes an acceptable program to manage the integrity of a barrier coating for internal or external coatings.

Evaluation:

[3.3.1-186] - ONS has no aluminum or aluminum alloy tanks within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks" in the scope of SLR in auxiliary systems.

[3.3.1-189] - This item is aligned to the following SSCs:

- Aluminum piping in the filtered water system: The ONS piping specification identifies this piping and fittings is constructed of 6061-T6 Alloy, which is not considered susceptible to stress corrosion cracking. This piping is exposed to a highly filtered lake water internal environment and an air-indoor uncontrolled external environment. Since the material is not susceptible to stress corrosion cracking, no AMP is required to manage stress corrosion cracking.
- Aluminum connectors on stored fire hose in the alternate chilled water and low pressure service water systems: These connectors are constructed of unknown aluminum alloy series, and therefore are assumed to be susceptible to stress corrosion cracking. These connectors are stored in a halide free air-indoor uncontrolled environment inside a storage trailer, and are not encapsulated in materials containing halides or exposed to secondary sources of moisture or halides.
- Filter bodies in the service air system are constructed of an unknown aluminum alloy series, and therefore are assumed to be susceptible to stress corrosion cracking. These components are exposed to a halide free air-indoor uncontrolled external environment in the turbine building, and a non-aggressive air-outdoor external environment in the yard. These filter bodies are not encapsulated in materials containing halides or exposed to secondary sources of moisture or halides. The internal environment for these components is a non-aggressive condensation environment.
- Filter bodies in the electro-hydraulic control system are constructed of an unknown aluminum alloy series, and therefore are assumed to be susceptible to stress corrosion cracking. These components are exposed to a halide free air-indoor uncontrolled environment external in the turbine building, and are not encapsulated in materials containing halides or exposed to secondary sources of moisture or halides. The internal environment is purified oil, which is not an environment that would promote stress corrosion cracking.
- A lubricating oil strainer housing in the standby shutdown facility diesel generator lube oil system is constructed of an unknown aluminum alloy series, and therefore are assumed to be susceptible to stress corrosion cracking. This housing is exposed to a halide free air-indoor uncontrolled environment external in the standby shutdown facility structure, and is not encapsulated in materials containing halides or exposed to secondary sources of moisture or halides. The internal environment is purified oil, which is not an environment that would promote stress corrosion cracking.

Aggressive external environments may exist where there are concentrations of airborne particles such as near industrial facilities that discharge soot, or near the sea coast where salt spray is prevalent. ONS is located in a mountainous area with moderate rainfall where airborne particle concentrations are comparatively low. While small amounts of halides may be present in outside air from environmental sources, the operating experience at ONS indicates that the concentration is not sufficient to contribute to aging that causes a loss of function for aluminum components, and that cracking due to stress corrosion cracking has not occurred on surfaces of aluminum alloys exposed to air and condensation environments in auxiliary systems. For those components constructed of a susceptible material, the *One-Time Inspection* program (B2.1.20) will be implemented to confirm that cracking due to stress corrosion cracking is not occurring on aluminum piping or piping components exposed to air or condensation environments.

[3.3.1-192] - ONS has no aluminum underground piping, piping components, or tanks in the scope of SLR in auxiliary systems.

[3.3.1-233] - The boric acid mixing tanks in the chemical addition system, and the concentrated boric acid tanks in the coolant storage system are constructed of 5052 alloy, and considered to be potentially susceptible to stress corrosion cracking. These tanks are exposed to a halide free air-indoor uncontrolled external environment in the auxiliary building, and a treated borated water internal environment. Both the boric acid mixing tanks and the concentrated boric acid tanks are insulated, and are heat traced such that condensation is not a concern. An OE review does not reflect that external surfaces of these tanks have been exposed to secondary sources of halides. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that cracking due to stress corrosion cracking is not occurring on surfaces of aluminum tanks exposed to an air-indoor uncontrolled environment.

[3.3.1-254] – Aluminum cooling coil fins installed in alternate chilled water system, chilled water (vital loads) system, high pressure service water, and ventilation systems air handing units are exposed to a halide free indoor uncontrolled environment with potential condensation in the auxiliary building, and a non-aggressive outdoor air external environment with potential condensation in the yard. These fins are not encapsulated in materials containing halides or exposed to secondary sources of moisture or halides. The specific series of the aluminum alloy is unknown, and they are assumed to be made of a material that is susceptible to stress corrosion cracking.

Aggressive external environments may exist where there are concentrations of airborne particles such as near industrial facilities that discharge soot, or near the sea coast where salt spray is prevalent. ONS is located in a mountainous area with moderate rainfall where airborne particle concentrations are comparatively low. While small amounts of halides may be present in outside air from environmental sources, the OE at ONS indicates that the concentration is not sufficient to contribute to aging that causes a loss of function for aluminum components, and that cracking due to stress corrosion cracking has not occurred on surfaces of aluminum alloys exposed to air environments in auxiliary systems. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that cracking due to stress corrosion cracking is not occurring on aluminum heat exchanger components exposed to air or condensation environments.

3.3.2.2.9 Loss of Material Due to General, Crevice or Pitting Corrosion and Cracking Due to Stress Corrosion Cracking

<u>NUREG-2192:</u>

Loss of material due to general (steel only), crevice, or pitting corrosion, and cracking due to SCC (SS only) can occur in steel and SS piping and piping components exposed to concrete. Concrete provides a high alkalinity environment that can mitigate the effects of loss of material for steel piping, thereby significantly reducing the corrosion rate. However, if water intrudes *through the concrete, the pH can be reduced and ions that promote loss of material such as chlorides, which can penetrate the protective oxide layer created in the high alkalinity environment, can reach the surface of the metal. Carbonation can reduce the pH within concrete. The rate of carbonation is reduced by using concrete with a low water-to-cement ratio and low permeability. Concrete with low permeability also reduces the potential for the penetration of water. Adequate air entrainment improves the ability of the concrete to resist freezing and thawing cycles and therefore reduces the potential for cracking and intrusion of water. Cracking due to SCC, as well as pitting and crevice corrosion can occur due to halides present in the water that penetrates to the surface of the metal.*

If the following conditions are met, loss of material is not considered to be an applicable aging effect for steel: (a) attributes of the concrete are consistent with American Concrete Institute (ACI) 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG–1557; (b) plant-specific OE indicates no degradation of the concrete that could lead to penetration of water to the metal surface; and (c) the piping is not potentially exposed to groundwater. For SS components, loss of material and cracking due to SCC are not considered to be applicable aging effects as long as the piping is not potentially exposed to groundwater. Where these conditions are not met, loss of material due to general (steel only), crevice, or pitting corrosion, and cracking due to SCC (SS only) are identified as applicable aging effects. GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," describes an acceptable program to manage these aging effects.

Evaluation:

Loss of material due to general (steel only), crevice, or pitting corrosion, and cracking due to stress corrosion cracking (stainless steel only) can occur in steel and stainless steel components exposed to concrete.

[3.3.1-112] – Loss of material of steel piping components or structural steel with an external environment of concrete that do not exit the concrete into soil is not an applicable aging effect requiring management. Steel components that do not exit the concrete into soil are not potentially exposed to groundwater. Structural steel embedded in reinforced concrete within building walls are not potentially exposed to groundwater. The concrete in areas containing these components conforms to ACI 349 or ACI 318. Review of ONS operating experience did not identify degradation of concrete around embedded components that could lead to penetration of water.

Loss of material can occur for steel piping components with an external environment of concrete that are potentially exposed to groundwater. Embedded piping that exits concrete into soil is potentially exposed to groundwater. Loss of material for steel components with an external environment of concrete that exit the concrete into soil is managed by the *Buried and Underground Piping and Tanks* (B2.1.26) program, as identified in Item [3.3.1-109].

[3.3.1-202] – Loss of material and cracking of stainless steel components exposed to concrete is not an aging effect for components that are not potentially exposed to groundwater. Stainless steel piping components exposed to concrete within interior concrete structures are not potentially exposed to groundwater. The stainless steel fuel pool liner and structural elements associated with the fuel pool and the stainless steel auxiliary building sumps that are exposed to concrete are also not potentially exposed to groundwater.

Loss of material and cracking could occur for stainless steel piping components with an external environment of concrete that are potentially exposed to groundwater. Embedded piping that exits concrete into soil is potentially exposed to groundwater. ONS has no in scope embedded stainless steel piping that exits concrete directly into the soil. Loss of material and cracking for stainless steel components with an external environment of soil is managed by the *Buried and Underground Piping and Tanks* (B2.1.26) program, as identified in Item [3.3.1-107] and [3.3.1-144].

3.3.2.2.10 Loss of Material Due to Pitting and Crevice Corrosion in Aluminum Alloys

NUREG-2192:

Loss of material due to pitting and crevice corrosion could occur in aluminum piping, piping components, and tanks exposed to an air, condensation, underground, raw water, or waste water environment for a sufficient duration of time. Environments that can result in pitting and/or crevice corrosion of aluminum alloys are those that contain halides (e.g., chloride) in the presence of moisture. The moisture level and halide concentration in atmospheric and uncontrolled air are greatly dependent on geographical location and site-specific conditions. Moisture level and halide concentration should be considered high enough to facilitate pitting and/or crevice corrosion of aluminum alloys in atmospheric and uncontrolled air, unless demonstrated otherwise. The periodic introduction of moisture or halides into an environment from secondary sources should also be considered. Leakage of fluids from mechanical connections (e.g., insulated bolted flanges and valve packing); onto a component in indoor controlled air is an example of a secondary source that should be considered. Halide concentrations should be considered high enough to facilitate loss of material of aluminum alloys in untreated aqueous solutions, unless demonstrated otherwise. Plant-specific OE and the condition of aluminum alloy components are evaluated to determine if prolonged exposure to the plant-specific air, condensation, underground, or water environments has resulted in pitting or crevice corrosion. Loss of material due to pitting and crevice corrosion is not an aging effect requiring management for aluminum alloys if (a) plant-specific OE does not reveal a history of loss of material due to pitting or crevice corrosion and (b) a one-time inspection demonstrates that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components. The applicant documents the results of the plant-specific OE review in the SLRA.

In the environment of air-indoor controlled, pitting and crevice corrosion is only expected to occur as the result of a source of moisture and halides. Alloy susceptibility may be considered when reviewing OE and interpreting inspection results. Inspections focus on the most susceptible alloys and locations.

The GALL-SLR Report recommends the further evaluation of aluminum piping, piping components, and tanks exposed to an air, condensation, or underground environment to *determine whether an AMP is needed to manage the aging effect of loss of material due to pitting and crevice corrosion. GALL-SLR Report AMP XI.M32, “One-Time Inspection,” describes an acceptable program to demonstrate that the aging effect of loss of material due to pitting and crevice corrosion is not occurring at a rate that will affect the intended function of the components. If loss of material due to pitting or crevice corrosion has occurred and is sufficient to potentially affect the intended function of an SSC, the following AMPs describe acceptable programs to manage loss of material due to pitting and crevice corrosion: (i) GALL-SLR Report AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” for tanks; (ii) GALL-SLR Report AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” for external surfaces of piping and piping components; (iii) GALL-SLR Report AMP XI.M41, “Buried and Underground Piping and Tanks,” for underground piping, piping components and tanks; and (iv) GALL-SLR Report AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components” for internal surfaces of components that are not included in other AMPs. The timing of the one-time or periodic inspections is consistent with that recommended in the AMP selected by the applicant during the development of the SLRA. For example, one-time inspections would be conducted between the 50th and 60th year of operation, as recommended by the “detection of aging effects” program element in GALL-SLR Report AMP XI.M32.*

An alternative strategy to demonstrating that an aggressive environment is not present is to isolate the aluminum alloy from the environment using a barrier to prevent loss of material due to pitting and crevice corrosion. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. The GALL-SLR Report AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks,” or equivalent program, describes an acceptable program to manage the integrity of a barrier coating.

Evaluation:

Aggressive external environments may exist where there are concentrations of airborne particles such as near industrial facilities that discharge soot, or near the sea coast where salt spray is prevalent. ONS is located in a mountainous area with moderate rainfall where airborne particle concentrations are comparatively low. A review of ONS OE reflects that loss of material due to pitting and crevice corrosion has not been identified in aluminum piping, piping components, and tanks exposed to air, condensation, or raw water environments in ONS auxiliary systems.

[3.3.1-223] - Not applicable. ONS has no aluminum underground piping, piping components, or tanks in the scope of SLR in auxiliary systems.

[3.3.1-227] - Not applicable. ONS has no aluminum tanks within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks” in the scope of SLR in auxiliary systems.

[3.3.1-234] - The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of aluminum piping and piping components exposed to air or condensation environments is not occurring.

[3.3.1-240] - Not applicable. ONS has no aluminum heat exchanger components exposed to waste water in the scope of SLR in auxiliary systems

[3.3.1-242] - The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of aluminum heat exchanger components exposed to air or condensation environments is not occurring.

[3.3.1-245] - The boric acid mixing tanks in the chemical addition system and the concentrated boric acid tanks in the coolant storage system are aligned to this item. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of insulated aluminum tanks exposed to air or condensation environments is not occurring.

[3.3.1-247] - Aluminum piping and fittings in the filtered water system are aligned to this item. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that pitting and crevice corrosion of aluminum piping and piping components exposed to a raw water environment is not occurring.

Results Tables: Auxiliary Systems

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-001	Steel cranes: bridges, structural members, structural components exposed to any environment	Cumulative fatigue damage due to failure	TLAA, SRP-SLR Section 4.7 "Other Plant-Specific TLAAs"	Yes (SRP-SLR Section 3.3.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of steel crane components is a TLAA. The evaluation of this TLAA is addressed in Section 4.7.5. Civil / Structural components are aligned to this item. See further evaluation in Section 3.3.2.2.1.
3.3.1-002	Stainless steel, steel heat exchanger components and tubes, piping, piping components exposed to any environment	Cumulative fatigue damage due to failure	TLAA, SRP-SLR Section 4.3 "Metal Fatigue"	Yes (SRP-SLR Section 3.3.2.2.1)	Consistent with NUREG-2191. Cumulative fatigue damage of stainless steel or steel components is a TLAA. The evaluation of this TLAA is addressed in Section 4.3. In addition to auxiliary systems, components in steam and power conversion systems are aligned to this item. See further evaluation in Section 3.3.2.2.1.
3.3.1-003	Stainless steel heat exchanger tubing, non-regenerative exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking; cyclic loading	AMP XI.M2, "Water Chemistry"	Yes (SRP-SLR Section 3.3.2.2.2)	Not applicable. ONS has no stainless steel PWR nonregenerative heat exchanger tubing exposed to treated borated water greater than 60 °C (140 °F) in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used. See further evaluation in Section 3.3.2.2.2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-003a	Stainless steel heat exchanger tubing, non-regenerative exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking; cyclic loading	AMP XI.M2, "Water Chemistry" and AMP XI.M21A, "Closed Treated Water Systems"	Yes (SRP-SLR Section 3.3.2.2.2)	Not applicable. ONS has no stainless steel PWR nonregenerative heat exchanger tubing exposed to treated borated water greater than 60 °C (140 °F) in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used. See further evaluation in Section 3.3.2.2.2.
3.3.1-004	Stainless steel piping, piping components, tanks exposed to air, condensation	Cracking due to stress corrosion cracking	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.3)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.3.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-006	Stainless steel, nickel alloy piping, piping components exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.4)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.4.
3.3.1-007	Stainless steel high pressure pump, casing exposed to treated borated water	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Consistent with NUREG-2191. Components in Engineered Safety Features systems are aligned to this item.
3.3.1-008	Stainless steel heat exchanger components and tubes exposed to treated borated water >60°C (>140°F)	Cracking due to cyclic loading	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Consistent with NUREG-2191. Components in Engineered Safety Features systems are aligned to this item.
3.3.1-009	Steel, copper alloy (>15% Zn) external surfaces, piping, piping components exposed to air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No	Consistent with NUREG-2191.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-010	High-strength steel closure bolting exposed to air, soil, underground	Cracking due to stress corrosion cracking; cyclic loading	AMP XI.M18, “Bolting Integrity”	No	Not applicable. ONS has no in-scope high-strength steel closure bolting exposed to air, soil, or underground environments in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-012	Steel; stainless steel, nickel alloy closure bolting exposed to air - indoor uncontrolled, air - outdoor, condensation	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, “Bolting Integrity”	No	Consistent with NUREG-2191.
3.3.1-015	Metallic closure bolting exposed to any environment, soil, underground	Loss of preload due to thermal effects, gasket creep, self-loosening	AMP XI.M18, “Bolting Integrity”	No	Consistent with NUREG-2191.
3.3.1-016	Stainless steel piping, piping components outboard the second containment isolation valves with a diameter ≥4 inches nominal pipe size exposed to treated water >93°C (>200°F)	Cracking due to stress corrosion cracking, IGSCC	AMP XI.M2, “Water Chemistry,” and AMP XI.M25, “BWR Reactor Water Cleanup System”	No	Not applicable - BWR only.
3.3.1-017	Stainless steel heat exchanger tubes exposed to treated water, treated borated water	Reduction of heat transfer due to fouling	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191. Spent Fuel Cooling heat exchanger plates (plate and frame heat exchanger) are also aligned to this item.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-018	Stainless steel high pressure pump casing, piping, piping components, tanks exposed to treated borated water >60°C (>140°F), sodium pentaborate solution >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. The associated NUREG-2191 aging items are not used.
3.3.1-019	Stainless steel regenerative heat exchanger components exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable - BWR only.
3.3.1-020	Stainless steel, steel with stainless steel cladding heat exchanger components exposed to treated borated water >60°C (>140°F), treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191.
3.3.1-021	Steel piping, piping components exposed to treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable - BWR only.
3.3.1-022	Copper alloy piping, piping components exposed to treated water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable - BWR only.
3.3.1-025	Aluminum piping, piping components exposed to treated water, treated borated water	Loss of material due to pitting, crevice corrosion	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-026	Steel (with stainless steel cladding) piping, piping components exposed to treated water	Loss of material due to general (only after cladding degradation), pitting, crevice corrosion, MIC	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable - BWR only.
3.3.1-027	Stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable - BWR only.
3.3.1-028	Stainless steel piping, piping components, tanks exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191. In addition to piping and piping components, bolting in the spent fuel cooling system is also aligned to this item.
3.3.1-030	Concrete, concrete cylinder piping, reinforced concrete, asbestos cement, cementitous piping, piping components exposed to raw water.	Cracking due to chemical reaction, weathering, settlement, or corrosion of reinforcement (reinforced concrete only); loss of material due to delamination, exfoliation, spalling, popout, scaling, or cavitation; flow blockage due to fouling	AMP XI.M20, “Open-Cycle Cooling Water System”	No	Not applicable. ONS has no in-scope concrete, concrete cylinder piping, reinforced concrete, asbestos cement, or cementitious piping, piping components exposed to raw water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-030a	Fiberglass, HDPE piping, piping components exposed to raw water	Cracking, blistering, loss of material due to exposure to ultraviolet light, ozone, radiation, temperature, or moisture; flow blockage due to fouling	AMP XI.M20, “Open-Cycle Cooling Water System”	No	Not applicable. Aging effects associated with HDPE piping exposed to raw water in ONS auxiliary systems are managed by the *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* (B2.1.24) program. The associated NUREG-2191 aging items are not used.
3.3.1-034	Nickel alloy, copper alloy piping, piping components exposed to raw water	Loss of material due to general (copper alloy only), pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, “Open-Cycle Cooling Water System”	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.
3.3.1-037	Steel piping, piping components exposed to raw water	Loss of material due to general, pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, “Open-Cycle Cooling Water System”	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-038	Copper alloy, steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-2191 with exceptions. In addition to auxiliary systems, components in Steam and Power Conversion systems are aligned to this item. Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.
3.3.1-040	Stainless steel piping, piping components exposed to raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.
3.3.1-042	Copper alloy, titanium, stainless steel heat exchanger tubes exposed to raw water, raw water (potable), treated water	Cracking due to stress corrosion cracking (titanium only), reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System" or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191 with exceptions. Recirculating Cooling Water heat exchanger plates (plate and frame heat exchanger) are also aligned to this item. Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-043	Stainless steel piping, piping components exposed to closed cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-2191.
3.3.1-044	Stainless steel; steel wtih stainless steel cladding heat exchanger components exposed to closed cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-2191.
3.3.1-045	Steel piping, piping components, tanks exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-2191.
3.3.1-046	Steel, copper alloy heat exchanger components, piping, piping components exposed to closed cycle cooling water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-2191.
3.3.1-047	Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No	Not applicable. BWR only
3.3.1-048	Aluminum piping, piping components exposed to closed cycle cooling water	Loss of material due to pitting, crevice corrosion	AMP XI.M21A, "Closed Treated Water Systems"	No	Not applicable. ONS has no in-scope aluminum piping, piping components exposed to closed-cycle cooling water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-049	Stainless steel piping, piping components exposed to closed cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-2191.
3.3.1-050	Stainless steel, copper alloy, steel heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-2191. Recirculating Cooling Water System and Spent Fuel Cooling System heat exchanger plates (plate and frame heat exchanger) are also aligned to this item.
3.3.1-051	Boraflex spent fuel storage racks: neutron absorbing sheets (PWR), spent fuel storage racks: neutron absorbing sheets (BWR) exposed to treated borated water, treated water	Reduction of neutron absorbing capacity due to boraflex degradation	AMP XI.M22, "Boraflex Monitoring"	No	Not applicable. Boraflex is not credited in ONS spent fuel storage criticality evaluations with an intended function for neutron attenuation. The associated NUREG-2191 aging items are not used.
3.3.1-052	Steel cranes: rails, bridges, structural members, structural components exposed to air	Loss of material due to general corrosion, wear, deformation, cracking	AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No	Consistent with NUREG-2191. Civil/ Structural components are aligned to this item.
3.3.1-055	Steel piping, piping components, tanks exposed to condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.
3.3.1-057	Elastomer fire barrier penetration seals exposed to air, condensation	Hardening, loss of strength, shrinkage due to elastomer degradation	AMP XI.M26, "Fire Protection"	No	Consistent with NUREG-2191. Civil/ Structural components are aligned to this item.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-058	Steel halon/carbon dioxide fire suppression system piping, piping components exposed to air - indoor uncontrolled, air - outdoor, condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M26, "Fire Protection"	No	Consistent with NUREG-2191.
3.3.1-059	Steel fire rated doors exposed to air	Loss of material due to wear	AMP XI.M26, "Fire Protection"	No	Consistent with NUREG-2191. Civil/ Structural components are aligned to this item.
3.3.1-060	Reinforced concrete structural fire barriers: walls, ceilings and floors exposed to air	Cracking due to chemical reaction, weathering, settlement, or corrosion of reinforcement; loss of material due to delamination, exfoliation, spalling, popout, or scaling	AMP XI.M26, "Fire Protection" and AMP XI.S6, "Structures Monitoring"	No	Consistent with NUREG-2191. Civil/ Structural components are aligned to this item.
3.3.1-063	Steel fire hydrants exposed to air - outdoor, raw water, raw water (potable), treated water	Loss of material due to general, pitting, crevice corrosion; flow blockage due to fouling (raw water, raw water (potable) only)	AMP XI.M27, "Fire Water System"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Fire Water System* (B2.1.16) program implementation.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-064	Steel, copper alloy piping, piping components exposed to raw water, treated water, raw water (potable)	Loss of material due to general (steel; copper alloy in raw water and raw water (potable) only), pitting, crevice corrosion, MIC; flow blockage due to fouling (raw water; raw water (potable) for steel only)	AMP XI.M27, "Fire Water System"	No	Consistent with NUREG-2191 with exceptions. Cement lined piping is managed by the *Fire Water System* (B2.1.16) program only for flow blockage. Degradation of the cement lining is managed by *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (B2.1.27) program. Exceptions apply to the NUREG-2191 recommendations for the *Fire Water System* (B2.1.16) program implementation.
3.3.1-065	Aluminum piping, piping components exposed to raw water, treated water, raw water (potable)	Loss of material due to pitting, crevice corrosion; flow blockage due to fouling (raw water only)	AMP XI.M27, "Fire Water System"	No	Not applicable. ONS has no in-scope aluminum piping, piping components exposed to raw water, treated water, or raw water (potable) in fire water service. The associated NUREG-2191 aging items are not used.
3.3.1-066	Stainless steel piping, piping components exposed to raw water, treated water, raw water (potable)	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling (raw water only)	AMP XI.M27, "Fire Water System"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Fire Water System* (B2.1.16) program implementation.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-069	Copper alloy piping, piping components exposed to fuel oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection," or AMP XI.M30, "Fuel Oil Chemistry"	No	Not applicable. ONS has no in-scope copper alloy piping, piping components exposed to fuel oil in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-070	Steel piping, piping components, tanks exposed to fuel oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection," or AMP XI.M30, "Fuel Oil Chemistry"	No	Consistent with NUREG-2191, except that a different program is applied to some components. Loss of material in fuel oil system components that supply fuel oil to the auxiliary boilers is managed by the *Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components* (B2.1.24) program.
3.3.1-071	Stainless steel, aluminum, nickel alloy piping, piping components exposed to fuel oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M30, "Fuel Oil Chemistry," and AMP XI.M32, "One-Time Inspection," or AMP XI.M30, "Fuel Oil Chemistry"	No	Consistent with NUREG-2191, except that a different program is applied to some components. Loss of material in fuel oil system components that supply fuel oil to the auxiliary boilers is managed by the *Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components* (B2.1.24) program.
3.3.1-072	Gray cast iron, ductile iron, copper alloy (>15% Zn or >8% Al) piping, piping components, heat exchanger components exposed to treated water, closed cycle cooling water, soil, raw water, raw water (potable), waste water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No	Consistent with NUREG-2191. in addition to auxiliary systems, components in Steam and Power Conversion systems are aligned to this item.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-073	Concrete, concrete cylinder piping, reinforced concrete, asbestos cement, cementitious piping, piping components exposed to air – outdoor	Cracking due to chemical reaction, weathering, or corrosion of reinforcement (reinforced concrete only); loss of material due to delamination, exfoliation, spalling, popout, or scaling	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Not applicable. ONS has no concrete, concrete cylinder piping, reinforced concrete, asbestos cement, or cementitious piping, piping components exposed to air - outdoor in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-076	Elastomer piping, piping components, ducting, ducting components, seals exposed to air, condensation	Hardening or loss of strength due to elastomer degradation	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-2191.
3.3.1-078	Steel external surfaces exposed to air - indoor uncontrolled, air - outdoor, condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-2191.
3.3.1-080	Steel heat exchanger components, piping, piping components exposed to air - indoor uncontrolled, air - outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-2191.
3.3.1-082	Elastomer, fiberglass piping, piping components, ducting, ducting components, seals exposed to air	Loss of material due to wear	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-2191.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-083	Stainless steel diesel engine exhaust piping, piping components exposed to diesel exhaust	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.
3.3.1-085	Elastomer piping, piping components, seals exposed to air, condensation, closed cycle cooling water, treated borated water, treated water, raw water, raw water (potable), waste water, gas, fuel oil, lubricating oil	Hardening or loss of strength due to elastomer degradation; flow blockage due to fouling (raw water, waste water only)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.
3.3.1-088	Steel; stainless steel piping, piping components, diesel engine exhaust exposed to raw water (potable), diesel exhaust	Loss of material due to general (steel only), pitting, crevice corrosion, flow blockage due to fouling (steel only for raw water (potable) environment)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191. in addition to auxiliary systems, components in Steam and Power Conversion systems are aligned to this item.
3.3.1-089	Steel piping, piping components exposed to condensation (internal)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M27, "Fire Water System"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Fire Water System* (B2.1.16) program implementation.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-090	Steel ducting, ducting components (internal surfaces) exposed to condensation	Loss of material due to general, pitting, crevice corrosion, MIC (for drip pans and drain lines only)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.
3.3.1-091	Steel piping, piping components, heat exchanger components, tanks exposed to waste water	Loss of material due to general, pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191. in addition to auxiliary systems, components in Steam and Power Conversion systems are aligned to this item.
3.3.1-093	Copper alloy piping, piping components exposed to raw water (potable)	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.
3.3.1-094	Stainless steel ducting, ducting components exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes (SRP-SLR Section 3.3.2.2.4)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.4.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-094a	Stainless steel ducting, ducting components exposed to air, condensation	Cracking due to stress corrosion cracking	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes (SRP-SLR Section 3.3.2.2.3)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.3.
3.3.1-095	Copper alloy, stainless steel, nickel alloy piping, piping components, heat exchanger components, tanks exposed to waste water	Loss of material due to general (copper alloy only), pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191. in addition to auxiliary systems, components in Steam and Power Conversion systems are aligned to this item.
3.3.1-096	Elastomer piping, piping components, seals exposed to air, raw water, raw water (potable), treated water, waste water	Loss of material due to wear; flow blockage due to fouling (raw water, waste water only)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.
3.3.1-096a	Steel, aluminum, copper alloy, stainless steel, titanium heat exchanger tubes internal to components exposed to air, condensation (external)	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.
3.3.1-096b	Steel heat exchanger components exposed to condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-2191.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-097	Steel piping, piping components exposed to lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191.
3.3.1-098	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191.
3.3.1-099	Copper alloy, aluminum piping, piping components exposed to lubricating oil	Loss of material due to pitting, crevice corrosion, MIC (copper alloy only)	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191.
3.3.1-100	Stainless steel piping, piping components exposed to lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191. In addition to auxiliary systems, components in reactor vessel, internals, and reactor coolant system are aligned to this item.
3.3.1-101	Aluminum heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. ONS has no aluminum heat exchanger tubes exposed to lubricating oil in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-102	Boral®; boron steel, and other materials (excluding Boraflex) spent fuel storage racks: neutron absorbing sheets (PWR), spent fuel storage racks: neutron absorbing sheets (BWR) exposed to treated borated water, treated water	Reduction of neutron absorbing capacity; change in dimensions and loss of material due to effects of spent fuel pool environment	AMP XI.M40, "Monitoring of Neutron Absorbing Materials Other than Boraflex"	No	Not applicable. ONS has no Boral®; boron steel, and other materials (excluding Boraflex) spent fuel storage racks: neutron-absorbing sheets exposed to treated borated water or treated water. The associated NUREG-2191 aging items are not used.
3.3.1-103	Concrete, concrete cylinder piping, reinforced concrete, asbestos cement, cementitious piping, piping components exposed to soil, concrete	Cracking due to chemical reaction, weathering, or corrosion of reinforcement (reinforced concrete only); loss of material due to delamination, exfoliation, spalling, popout, or scaling	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no concrete, concrete cylinder piping, reinforced concrete, asbestos cement, cementitious piping, piping components exposed to soil, concrete in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-104	HDPE, fiberglass piping, piping components exposed to soil, concrete	Cracking, blistering, loss of material due to exposure to ultraviolet light, ozone, radiation, temperature, or moisture	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no HDPE, fiberglass piping, piping components exposed to soil, concrete in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-107	Stainless steel, nickel alloy piping, piping components exposed to soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Buried and Underground Piping and Tanks* (B2.1.26) program implementation.
3.3.1-108	Titanium, super austenitic, copper alloy, stainless steel, nickel alloy piping, piping components, tanks, closure bolting exposed to soil, concrete, underground	Loss of material due to general (copper alloy only), pitting, crevice corrosion, MIC (super austenitic, copper alloy, stainless steel, nickel alloy; soil environment only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Buried and Underground Piping and Tanks* (B2.1.26) program implementation.
3.3.1-109	Steel piping, piping components, closure bolting exposed to soil, concrete, underground	Loss of material due to general, pitting, crevice corrosion, MIC (soil only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Buried and Underground Piping and Tanks* (B2.1.26) program implementation.
3.3.1-110	Stainless steel, nickel alloy piping, piping components greater than or equal to 4 NPS exposed to treated water >93°C (>200°F)	Cracking due to stress corrosion cracking, IGSCC	AMP XI.M7, "BWR Stress Corrosion Cracking," and AMP XI.M2, "Water Chemistry"	No	Not applicable. BWR only

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-111	Steel structural steel exposed to air - indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, “Structures Monitoring”	No	Not applicable. Structural steel is treated as a Civil / Structural commodity and addressed in Section 3.5. The associated NUREG-2191 aging items are not used.
3.3.1-112	Steel piping, piping components exposed to concrete	None	None	Yes (SRP-SLR Section 3.3.2.2.9)	Consistent with NUREG-2191. In addition to auxiliary systems, Civil / Structural components (Keowee Hydro Station penstock, power tunnels, spillway intake: steel elements) are aligned to this item. See further evaluation in Section 3.3.2.2.9.
3.3.1-113	Aluminum piping, piping components exposed to gas	None	None	No	Consistent with NUREG-2191.
3.3.1-114	Copper alloy piping, piping components exposed to air, condensation, gas	None	None	No	Consistent with NUREG-2191. In addition to auxiliary systems, components from Reactor Vessel, Internals, and Reactor Coolant System are aligned to this item.
3.3.1-115	Copper alloy, copper alloy (>8% Al) piping, piping components exposed to air with borated water leakage	None	None	No	Consistent with NUREG-2191.
3.3.1-116	Galvanized steel piping, piping components exposed to air - indoor uncontrolled	None	None	No	Consistent with NUREG-2191. in addition to auxiliary systems, components in Steam and Power Conversion systems are aligned to this item.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-117	Glass piping elements exposed to air, lubricating oil, closed-cycle cooling water, fuel oil, raw water, treated water, treated borated water, air with borated water leakage, condensation, gas underground	None	None	No	Consistent with NUREG-2191.
3.3.1-119	Nickel alloy, PVC, glass piping, piping components exposed to air with borated water leakage, air - indoor uncontrolled, condensation, waste water, raw water (potable)	None	None	No	Consistent with NUREG-2191. In addition to auxiliary systems, Civil / Structural components (PVC conduit) are aligned to this item.
3.3.1-120	Stainless steel piping, piping components exposed to air with borated water leakage, gas	None	None	No	Consistent with NUREG-2191.
3.3.1-121	Steel piping, piping components exposed to air - indoor controlled, gas	None	None	No	Consistent with NUREG-2191.
3.3.1-122	Titanium heat exchanger components, piping, piping components exposed to air - indoor uncontrolled, air - outdoor	None	None	No	Not applicable. ONS has no titanium heat exchanger components, piping, piping components exposed to air – indoor uncontrolled, air – outdoor in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-123	Titanium heat exchanger components other than tubes, piping and piping components exposed to raw water	Cracking due to stress corrosion cracking, flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System," or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no titanium heat exchanger components other than tubes, piping and piping components exposed to raw water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-124	Stainless steel, steel (with stainless steel or nickel alloy cladding) spent fuel storage racks (BWR), spent fuel storage racks (PWR), piping, piping components exposed to treated water >60°C (>140°F), treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Consistent with NUREG-2191. Spent fuel storage racks are Civil / Structural commodities, and are aligned to this item. Cracking due to SCC of piping, piping components exposed to treated borated water >60°C (>140°F) is addressed in Item 3.3.1-028.
3.3.1-125	Stainless steel, steel (with stainless steel cladding), nickel alloy spent fuel storage racks (BWR), spent fuel storage racks (PWR), piping, piping components exposed to treated water, treated borated water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Consistent with NUREG-2191. in addition to auxiliary systems, civil / structural components (spent fuel storage racks) are aligned to this item.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-126	Metallic piping, piping components exposed to treated water, treated borated water, raw water	Wall thinning due to erosion	AMP XI.M17, "Flow-Accelerated Corrosion"	No	Not applicable. Wall thinning due to erosion has not been identified as an applicable aging effect in ONS metallic piping, piping components exposed to treated water, treated borated water, or raw water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-127	Metallic piping, piping components, tanks exposed to raw water, raw water (potable), treated water, waste water	Loss of material due to recurring internal corrosion	AMP XI.M20, "Open-Cycle Cooling Water System," AMP XI.M27, "Fire Water System," or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Yes (SRP-SLR Section 3.3.2.2.7)	Consistent with NUREG-2191 with exceptions. Recurring internal corrosion in steel piping, piping components exposed to raw water is addressed in the *Open-Cycle Cooling Water System* (B2.1.11) program. See further evaluation in Section 3.3.2.2.7 Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.
3.3.1-128	Steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil, concrete, air, condensation, raw water	Loss of material due to general, pitting, crevice corrosion, MIC (soil, raw water only)	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks"	No	Not applicable. ONS has no steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil, concrete, air, condensation, raw water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-130	Metallic sprinklers exposed to air, condensation, raw water, raw water (potable), treated water	Loss of material due to general (where applicable), pitting, crevice corrosion, MIC (except for aluminum, and in raw water, raw water (potable), treated water only); flow blockage due to fouling	AMP XI.M27, “Fire Water System”	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Fire Water System* (B2.1.16) program implementation.
3.3.1-131	Steel, stainless steel, copper alloy, aluminum piping, piping components exposed to air, condensation	Flow blockage due to fouling	AMP XI.M27, “Fire Water System”	No	Not applicable. The associated NUREG-2191 aging items are not used.
3.3.1-132	Insulated steel, copper alloy (>15% Zn or >8% Al), piping, piping components, tanks, tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to air, condensation	Loss of material due to general, pitting, crevice corrosion (steel only); cracking due to SCC (copper alloy (>15% Zn or >8% Al) only)	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components" or AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks”	No	Consistent with NUREG-2191.
3.3.1-133	HDPE underground piping, piping components	Cracking, blistering	AMP XI.M41, “Buried and Underground Piping and Tanks”	No	Not applicable. ONS has no HDPE underground piping, piping components in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-134	Steel, stainless steel, copper alloy piping, piping components, and heat exchanger components exposed to raw water (for components not covered by NRC GL 89-13)	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.
3.3.1-135	Steel, stainless steel pump casings exposed to waste water environment	Loss of material due to general (steel only), pitting, crevice corrosion, MIC	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. ONS has no steel or stainless steel pump casings with a waste water external environment in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-136	Steel fire water storage tanks exposed to air, condensation, soil, concrete, raw water, raw water (potable), treated water	Loss of material due to general, pitting, crevice corrosion, MIC (raw water, raw water (potable), treated water, soil only)	AMP XI.M27, "Fire Water System"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Fire Water System* (B2.1.16) program implementation.
3.3.1-137	Steel, stainless steel, aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to treated water, raw water, waste water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC (steel, stainless steel only)	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks"	No	Not applicable. ONS has no steel, stainless steel, aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to treated water, raw water, waste water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-138	Any material piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, raw water (potable), treated water, treated borated water, fuel oil, lubricating oil, waste water, air-dry, air, condensation	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage; loss of material or cracking for cementitious coatings/linings	AMP XI. M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Consistent with NUREG-2191 with exceptions, and a different program is credited for some components. Aging effects for the Elevated Water Storage Tank are managed by the *Fire Water System* (B2.1.16) program. Aging effects for components in the Plant Drinking Water System, Ventilation System and Lube Oil System are managed by the *Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components* (B2.1.24) program. Components in the Lube Oil System aligned to this item are also managed by the *Open-Cycle Cooling Water System* (B2.1.11) program Exceptions apply to the NUREG-2191 recommendations for the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (B2.1.27) program implementation.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-139	Any material piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, raw water (potable), treated water, treated borated water, fuel oil, lubricating oil, waste water. air-dry, air, condensation	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI. M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Consistent with NUREG-2191 with exceptions, and a different program is credited for some components. Aging effects for the Elevated Water Storage Tank are managed by the *Fire Water System* (B2.1.16) program. Aging effects for components in the Plant Drinking Water and Ventilation Systems are managed by the *Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components* (B2.1.24) program. Exceptions apply to the NUREG-2191 recommendations for the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (B2.1.27) program implementation.
3.3.1-140	Gray cast iron, ductile iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, raw water (potable), treated water, waste water	Loss of material due to selective leaching	AMP XI. M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (B2.1.27) program implementation.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-142	Stainless steel, steel, nickel alloy, copper alloy closure bolting exposed to fuel oil, lubricating oil, treated water, treated borated water, raw water, waste water	Loss of material due to general (steel; copper alloy in raw water, waste water only), pitting, crevice corrosion, MIC (raw water and waste water environments only)	AMP XI.M18, “Bolting Integrity”	No	Consistent with NUREG-2191.
3.3.1-144	Stainless steel, steel, aluminum piping, piping components, tanks exposed to soil, concrete	Cracking due to stress corrosion cracking (steel in carbonate/ bicarbonate environment only)	AMP XI.M41, “Buried and Underground Piping and Tanks”	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Buried and Underground Piping and Tanks* (B2.1.26) program implementation.
3.3.1-145	Stainless steel closure bolting exposed to air, soil, concrete, underground, waste water	Cracking due to stress corrosion cracking	AMP XI.M18, “Bolting Integrity”	No	Consistent with NUREG-2191.
3.3.1-146	Stainless steel underground piping, piping components, tanks	Cracking due to stress corrosion cracking	AMP XI.M32, "One-Time Inspection," AMP XI.M41, “Buried and Underground Piping and Tanks,” or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.3.2.2.3)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.3.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-147	Nickel alloy, nickel alloy cladding piping, piping components exposed to closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XIM21A, “Closed Treated Water Systems”	No	Not applicable. ONS has no nickel alloy, nickel alloy cladding piping, piping components exposed to closed-cycle cooling water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-149	Fiberglass piping, piping components, ducting, ducting components exposed to air – outdoor	Cracking, blistering, loss of material due to exposure to ultraviolet light, ozone, radiation, temperature, or moisture	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components"	No	Not applicable. ONS has no fiberglass piping, piping components, ducting, ducting components exposed to air – outdoor in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-150	Fiberglass piping, piping components, ducting, ducting components exposed to air	Cracking, blistering, loss of material due to exposure to ultraviolet light, ozone, radiation, temperature, or moisture	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components"	No	Not applicable. ONS has no fiberglass piping, piping components, ducting, ducting components exposed to air in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-151	Stainless steel, steel, aluminum, copper alloy, titanium heat exchanger tubes exposed to air, condensation	Reduction of heat transfer due to fouling	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-2191.
3.3.1-155	Stainless steel piping, piping components, and tanks exposed to waste water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-157	Steel piping, piping components, heat exchanger components exposed to air-outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.M27, “Fire Water System,” or AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Consistent with NUREG-2191 with exceptions. Loss of material in High Pressure Service Water piping is managed by the *Fire Water System* (B2.1.16) program. The remaining components aligned to this item credit the *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* (B2.1.24) program. Exceptions apply to the NUREG-2191 recommendations for the *Fire Water System* (B2.1.16) program implementation.
3.3.1-158	Nickel alloy piping, piping components heat exchanger components (for components not covered by NRC GL 89-13) exposed to raw water	Loss of material due to pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no nickel alloy piping, piping components, or heat exchanger components exposed to raw water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-159	Fiberglass piping, piping components, ducting, ducting components exposed to air	Loss of material due to wear	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no fiberglass piping, piping components, ducting, ducting components exposed to air in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-160	Copper alloy (>15% Zn or >8% Al) piping, piping components, heat exchanger components exposed to closed-cycle cooling water, raw water, waste water	Cracking due to stress corrosion cracking	AMP XI.M20, "Open-Cycle Cooling Water System," AMP XI.M21A, "Closed Treated Water Systems," or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191 with exceptions. In addition to auxiliary systems, components in steam and power conversion systems are aligned to this item. Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.
3.3.1-161	Copper alloy heat exchanger tubes exposed to condensation	Reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.
3.3.1-166	Copper alloy piping, piping components exposed to concrete	None	None	No	Consistent with NUREG-2191.
3.3.1-167	Zinc piping components exposed to air-indoor controlled, air – indoor uncontrolled	None	None	No	Consistent with NUREG-2191.
3.3.1-169	Steel, copper alloy piping, piping components exposed to steam	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Not applicable. Aging effects for steel and copper alloy piping, piping components exposed to steam in ONS auxiliary systems were aligned to items in Steam and Power Conversion system with a treated water environment. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-170	Stainless steel piping, piping components exposed to steam	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Not applicable. Loss of material for stainless steel components exposed to steam is evaluated in 3.3.1-125. The associated NUREG-2191 aging items are not used.
3.3.1-172	PVC piping, piping components exposed to air-outdoor	Reduction in impact strength due to photolysis	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. Aging effects for polymeric piping in air - outdoor in auxiliary systems is addressed by SRP Item 3.3.1-263. The associated NUREG-2191 aging items are not used.
3.3.1-175	Fiberglass piping, piping components, tanks exposed to raw water (for components not covered by NRC GL 89-13), raw water (potable), treated water, waste water	Cracking, blistering, loss of material due to exposure to ultraviolet light, ozone, radiation, temperature, or moisture; flow blockage due to fouling (raw water, waste water only)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no fiberglass piping, piping components, tanks exposed to raw water (for components not covered by NRC GL 89-13), raw water (potable), treated water, or waste water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-176	Fiberglass piping, piping components, tanks exposed to raw water environment (for components not covered by NRC GL 89-13), raw water (potable), treated water, waste water	Loss of material due to wear; flow blockage due to fouling (raw water, waste water only)	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no fiberglass piping, piping components or tanks exposed to raw water environment (for components not covered by NRC GL 89-13), raw water (potable), treated water, or waste water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-177	Fiberglass piping, piping components exposed to soil	Loss of material due to wear	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no fiberglass piping or piping components exposed to soil in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-178	Fiberglass piping and piping components exposed to concrete	None	None	No	Not applicable. ONS has no fiberglass piping and piping components exposed to concrete in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-179	Masonry walls: structural fire barriers exposed to air	Cracking due to restraint shrinkage, creep, aggressive environment; loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.M26, "Fire Protection," and AMP XI.S5, "Masonry Walls"	No	Consistent with NUREG-2191. Civil/ Structural components are aligned to this item. Masonry walls addressed by this item are interior walls. Loss of material (spalling, scaling) and cracking due to freeze-thaw do not apply.
3.3.1-181	Titanium piping, piping components exposed to condensation	None	None	No	Not applicable. ONS has no titanium piping, piping components exposed to condensation in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-182	Non-metallic thermal insulation exposed to air, condensation	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-2191.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-184	PVC piping, piping components, tanks exposed to concrete	None	None	No	Consistent with NUREG-2191. This item is aligned to a Civil / Structural commodity for PVC conduit
3.3.1-185	Aluminum fire water storage tanks exposed to air, condensation, soil, concrete, raw water, raw water (potable), treated water	Cracking due to stress corrosion cracking	AMP XI.M27, “Fire Water System”	No	Not applicable. ONS has no aluminum fire water storage tanks in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-186	Aluminum tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to air, condensation, soil, concrete, raw water, waste water	Cracking due to stress corrosion cracking	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.3.2.2.8)	Not applicable. ONS has no aluminum tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-189	Aluminum piping, piping components, tanks exposed to air, condensation, raw water, raw water (potable), waste water	Cracking due to stress corrosion cracking	AMP XI.M32, "One-Time Inspection," AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.3.2.2.8)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.8.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-192	Aluminum underground piping, piping components, tanks	Cracking due to stress corrosion cracking	AMP XI.M32, "One-Time Inspection," AMP XI.M41, "Buried and Underground Piping and Tanks,' AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.8)	Not applicable. ONS has no in-scope aluminum underground piping, piping components, tanks in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-193	Steel components exposed to treated water, raw water, raw water (potable), waste water	Long-term loss of material due to general corrosion	AMP XI.M32, "One-Time Inspection,"	No	Consistent with NUREG-2191. in addition to auxiliary systems, components in steam and power conversion systems are aligned to this item.
3.3.1-194	PVC piping, piping components, and tanks exposed to soil	Loss of material due to wear	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no PVC piping, piping components, and tanks exposed to soil in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-195	Concrete, concrete cylinder piping, reinforced concrete, asbestos cement, cementitious piping, piping components exposed to raw water, treated water, raw water (potable)	Cracking due to chemical reaction, weathering, settlement, or corrosion of reinforcement (reinforced concrete only); loss of material due to delamination, exfoliation, spalling, popout, scaling, or cavitation; flow blockage due to fouling (raw water only)	AMP XI.M27, “Fire Water System”	No	Not applicable. ONS has no concrete, concrete cylinder piping, reinforced concrete, asbestos cement, cementitious piping, piping components exposed to raw water, treated water, raw water (potable) in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-196	HDPE piping, piping components exposed to raw water, treated water, raw water (potable)	Cracking, blistering; flow blockage due to fouling (raw water only)	AMP XI.M27, “Fire Water System”	No	Not applicable. ONS has no HDPE piping, piping components in fire water service in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-197	Metallic fire water system piping, piping components, heat exchanger, heat exchanger components (any material) with only a leakage boundary (spatial) or structural integrity (attached) intended function exposed to any external environment except soil, concrete	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-2191.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-198	Metallic fire water system piping, piping components, heat exchanger, heat exchanger components (any material) with only a leakage boundary (spatial) or structural integrity (attached) intended function	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion, MIC (all metallic materials except aluminum; in liquid environments only)	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. The associated NUREG-2191 aging items are not used.
3.3.1-199	Cranes: steel structural bolting exposed to air	Loss of preload due to self-loosening; loss of material due to general corrosion; cracking	AMP XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems”	No	Consistent with NUREG-2191. Civil/Structural components are aligned to this item.
3.3.1-202	Stainless steel piping, piping components exposed to concrete	None	None	Yes (SRP-SLR Section 3.3.2.2.9)	Consistent with NUREG-2191. Civil / Structural components (Spent Fuel Pool Liner and Auxiliary Building Sumps) are also aligned to this item. See further evaluation in Section 3.3.2.2.9.
3.3.1-203	Stainless steel; steel with stainless steel cladding, nickel alloy piping, piping components, heat exchanger components, tanks exposed to treated water, sodium pentaborate solution	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection"	No	Not applicable. BWR only

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-205	Insulated stainless steel piping, piping components, tanks exposed to air, condensation	Cracking due to stress corrosion cracking	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," or AMP XI.M42, "Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.3)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring on insulated surfaces, or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.3.
3.3.1-207	Stainless steel, copper alloy, titanium heat exchanger tubes exposed to raw water (for components not covered by NRC GL 89-13)	Cracking due to stress corrosion cracking (titanium only), reduction of heat transfer due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-208	Concrete, concrete cylinder piping, reinforced concrete, asbestos cement, cementitious piping, piping components exposed to raw water (for components not covered by NRC GL 89-13)	Cracking due to chemical reaction, weathering, settlement, or corrosion of reinforcement (reinforced concrete only); loss of material due to delamination, exfoliation, spalling, popout, scaling, or cavitation; flow blockage due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no concrete, concrete cylinder piping, reinforced concrete, asbestos cement, cementitious piping, piping components in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-210	HDPR piping, piping components exposed to raw water (for components not covered by NRC GL 89-13)	Cracking, blistering; flow blockage due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.
3.3.1-214	Copper alloy (>15% Zn or >8% Al) piping, piping components exposed to soil	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No	Not applicable. ONS has no copper alloy (>15% Zn or >8% Al) piping, piping components exposed to soil in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-215	Aluminum fire water storage tanks exposed to air, condensation, soil, concrete, raw water, raw water (potable), treated water	Loss of material due to pitting, crevice corrosion	AMP XI.M27, “Fire Water System”	No	Not applicable. ONS has no aluminum fire water storage tanks exposed to air, condensation, soil, concrete, raw water, raw water (potable), treated water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-216	Stainless steel fire water storage tanks exposed to air, condensation, soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M27, “Fire Water System”	No	Not applicable. ONS has no stainless steel fire water storage tanks exposed to air, condensation, soil, concrete in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-218	Stainless steel fire water storage tanks exposed to air, condensation, soil, concrete, raw water, raw water (potable), treated water	Loss of material due to pitting, crevice corrosion, MIC (water and soil environment only)	AMP XI.M27, “Fire Water System”	No	Not applicable. ONS has no stainless steel fire water storage tanks in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-219	Stainless steel piping, piping components exposed to steam	Cracking due to stress corrosion cracking	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. Cracking due to SCC for stainless steel piping, piping components exposed to steam in ONS auxiliary systems was aligned to SRP Item 3.3.1-028 for a Treated Borated water >60°C (>140°F) environment. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-222	Stainless steel, nickel alloy tanks exposed to air, condensation (internal/ external)	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.4)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.4.
3.3.1-223	Aluminum underground piping, piping components, tanks	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M41, "Buried and Underground Piping and Tanks," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.10)	Not applicable. ONS has no aluminum underground piping, piping components, tanks in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-226	Aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks"	No	Not applicable. ONS has no aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil, concrete in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-227	Aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.10)	Not applicable. ONS has no aluminum tanks within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks" in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-228	Stainless steel, nickel alloy tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.4)	Not applicable. ONS has no stainless steel or nickel alloy tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-229	Stainless steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil only)	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks"	No	Not applicable. ONS has no stainless steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil, concrete in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-230	Stainless steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil, concrete	Cracking due to stress corrosion cracking	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks"	No	Not applicable. ONS has no stainless steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil, concrete in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-231	Stainless steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to air, condensation	Cracking due to stress corrosion cracking	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.3)	Not applicable. ONS has no stainless steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-232	Insulated stainless steel, nickel alloy piping, piping components, tanks exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," or AMP XI.M42, "Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.4)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring on insulated surfaces, or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.4.
3.3.1-233	Insulated aluminum piping, piping components, tanks exposed to air, condensation	Cracking due to stress corrosion cracking	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," or AMP XI.M42, "Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.8)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring on insulated surfaces, or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.8.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-234	Aluminum piping, piping components, tanks exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.10)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.10.
3.3.1-235	Metallic piping, piping components exposed to air-dry (internal)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M24, "Compressed Air Monitoring"	No	Consistent with NUREG-2191.
3.3.1-236	Titanium heat exchanger tubes exposed to treated water	Cracking due to stress corrosion cracking, reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Not applicable. ONS has no titanium heat exchanger tubes exposed to treated water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-237	Titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, piping components exposed to treated water	None	None	No	Not applicable. ONS has no titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, piping components exposed to treated water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-238	Titanium heat exchanger tubes exposed to closed-cycle cooling water	Cracking due to stress corrosion cracking, reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water System"	No	Not applicable. ONS has no titanium heat exchanger tubes exposed to closed-cycle cooling water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-239	Titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, piping components exposed to closed-cycle cooling water	None	None	No	Not applicable. ONS has no titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, piping components exposed to closed-cycle cooling water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-240	Aluminum heat exchanger components exposed to waste water	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.10)	Not applicable. ONS has no aluminum heat exchanger components exposed to waste water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-241	Stainless steel, nickel alloy heat exchanger components exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.4)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. in addition to auxiliary systems, components in steam and power conversion systems are aligned to this item. See further evaluation in Section 3.3.2.2.4.
3.3.1-242	Aluminum heat exchanger components exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.10)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.10.
3.3.1-244	Stainless steel, nickel alloy piping, piping components exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Not applicable. BWR only

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-245	Insulated aluminum piping, piping components, tanks exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.3.2.2.10)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring on insulated surfaces, or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.10.
3.3.1-246	Stainless steel, nickel alloy underground piping, piping components, tanks	Loss of material due to pitting, crevice corrosion	AMP XI.M32, “One-Time Inspection,” AMP XI.M41, “Buried and Underground Piping and Tanks,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.3.2.2.4)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.4.
3.3.1-247	Aluminum piping, piping components, tanks exposed to raw water, waste water	Loss of material due to pitting, crevice corrosion	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.3.2.2.10)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.10.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-248	Aluminum piping, piping components, tanks exposed to air with borated water leakage	None	None	No	Consistent with NUREG-2191.
3.3.1-249	Steel heat exchanger tubes internal to components exposed to air-outdoor, air-indoor uncontrolled, condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191.
3.3.1-250	Steel reactor coolant pump oil collection system tanks, piping, piping components exposed to lubricating oil (waste oil)	Loss of material due to general, pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection"	No	Consistent with NUREG-2191, except that a different program is used for components in the Fuel Oil System. This item is aligned to portions of the Fuel Oil System potentially containing waste oil, contaminated oil, and solvents. Therefore, a periodic inspection program is used in lieu of a one time inspection. The *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* (B2.1.24) will be used to manage loss of material of steel tanks, piping, piping components exposed to lubricating oil (waste oil) in the Fuel Oil System. In addition to auxiliary systems, components in reactor vessel, internals, and reactor coolant system are aligned to this item.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-252	Aluminum piping, piping components exposed to soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no aluminum piping, piping components exposed to soil, concrete in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-253	PVC piping, piping components exposed to raw water, raw water (potable), treated water, waste water	Loss of material due to wear; flow blockage due to fouling (raw water only)	AMP XI.M20, "Open-Cycle Cooling Water System," AMP XI.M27, "Fire Water System," or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-2191. The *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* (B2.1.24) program is used to manage components aligned to this item.
3.3.1-254	Aluminum heat exchanger components exposed to air, condensation	Cracking due to stress corrosion cracking	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.3.2.2.8)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the SPEO. See further evaluation in Section 3.3.2.2.8.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-255	Any material fire damper assemblies exposed to air	Loss of material due to general, pitting, crevice corrosion; cracking due to stress corrosion cracking; hardening, loss of strength, shrinkage due to elastomer degradation	AMP XI.M26, “Fire Protection”	No	Consistent with NUREG-2191.
3.3.1-257	Steel, stainless steel, copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191.
3.3.1-258	Metallic, elastomer, fiberglass, HDPE piping, piping components exposed to waste water	Flow blockage due to fouling	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. This component and aging effect are addressed in lines rolling up to SRP 3.3.1-091 and 3.3.1-095. The associated NUREG-2191 aging items are not used.
3.3.1-259	Aluminum piping, piping components exposed to raw water	Flow blockage due to fouling	AMP XI.M20, “Open-Cycle Cooling Water System,” or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. Flow blockage due to fouling is not an aging effect requiring management in aluminum piping, piping components exposed to raw water in ONS auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-260	Metallic HVAC closure bolting exposed to air, condensation	Loss of material due to general (where applicable), pitting, crevice corrosion; cracking due to SCC, loss of preload	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-2191.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-261	Titanium (ASTM Grades 3, 4, or 5) heat exchanger tubes exposed to closed-cycle cooling water, raw water	Cracking due to SCC	AMP XI.M20, “Open-Cycle Cooling Water System,” or AMP XI.M21A, “Cosed Treated Water Systems”	No	Not applicable. ONS has no titanium (ASTM Grades 3, 4, or 5) heat exchanger tubes exposed to closed-cycle cooling water or raw water environments in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-262	Titanium piping, piping components, heat exchanger components exposed to closed-cycle cooling water, treated water	Cracking due to SCC	AMP XI.M20, “Open-Cycle Cooling Water System,” or AMP XI.M21A, “Closed Treated Water Systems,” or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no titanium piping, piping components, heat exchanger components exposed to closed-cycle cooling water, treated water in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-263	Polymeric piping, piping components, ducting, ducting components, seals exposed to air, condensation, raw water, raw water (potable), treated water, waste water, underground, concrete, soil	Hardening or loss of strength due to polymeric degradation; loss of material due to peeling, delamination, wear; cracking or blistering due to exposure to ultraviolet light, ozone, radiation, or chemical attack; flow blockage due to fouling	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Consistent with NUREG-2191.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-265	Steel heat exchanger tubes exposed to fuel oil	Reduction of heat transfer due to fouling	AMP XI.M30, “Fuel Oil Chemistry”, and AMP XI.M32, “One-Time Inspection”	No	Not applicable. ONS has no steel heat exchanger radiator tubes exposed to fuel oil in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-266	Steel heat exchanger tubes exposed to fuel oil	Reduction of heat transfer due to fouling	AMP XI.M30, “Fuel Oil Chemistry"	No	Not applicable. ONS has no steel heat exchanger radiator tubes exposed to fuel oil in the scope of SLR in auxiliary systems. The associated NUREG-2191 aging items are not used.
3.3.1-267	Subliming compound fireproofing/fire barriers (Thermo-lag®, Darmatt™, 3M™ Interam™, and other similar materials) exposed to air	Loss of material due to abrasion, flaking, vibration; cracking/ delamination due to chemical reaction, settlement; change in material properties due to gamma irradiation exposure; separation	AMP XI.M26, “Fire Protection”	No	Not applicable. Fire barrier materials are addressed in SRP Item 3.3.1-269. The associated NUREG-2191 aging items are not used.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-268	Cementitious coating fireproofing/fire barriers (Pyrocrete, BIO™ K-10 Mortar, Cafecote, and other similar materials) exposed to air	Loss of material due to abrasion, exfoliation, elevated temperature, flaking, spalling; cracking/ delamination due to chemical reaction, elevated temperature, settlement, vibration; change in material properties due to elevated temperature, gamma irradiation exposure; separation	AMP XI.M26, "Fire Protection"	No	Not applicable. Fire barrier materials are addressed in SRP Item 3.3.1-269. The associated NUREG-2191 aging items are not used.
3.3.1-269	Silicate fireproofing/fire barriers (Marinite®, Kaowool™, Cerafiber®, Cera® blanket, or other similar materials) exposed to air	Loss of material due to abrasion, flaking; cracking/ delamination due to settlement; change in material properties due to gamma irradiation exposure; separation	AMP XI.M26, "Fire Protection"	No	Consistent with NUREG-2191. Civil/ Structural components are aligned to this item.

Results Table: Auxiliary Systems AMR Results

Table 3.3.2-1 Auxiliary Systems - Auxiliary Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Piping	Structural Integrity	Galvanized Steel	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Table 3.3.2-1 Auxiliary Systems - Auxiliary Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-2 Auxiliary Systems - Breathing Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-2 Auxiliary Systems - Breathing Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1

Table 3.3.2-2 Auxiliary Systems - Breathing Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A, 2
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A, 2
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A, 2
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A, 2
Tank (breathing air receiver)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Trap Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-2 Auxiliary Systems - Breathing Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Trap Body	Structural Integrity	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1

Table 3.3.2-2 Auxiliary Systems - Breathing Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
2. The Breathing Air receiver tank level gauge is a magnetic float type indicator with no glass element.

Table 3.3.2-3 Auxiliary Systems - Hydrogen System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Heat Exchanger (hydrogen cooler) Water Box	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Piping	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1

Table 3.3.2-3 Auxiliary Systems - Hydrogen System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Waste Water (Internal)	None	None	VII.J.AP-277	3.3.1- 119	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Table 3.3.2-3 Auxiliary Systems - Hydrogen System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Trap Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
Valve Body	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	A, 1
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1

Table 3.3.2-3 Auxiliary Systems - Hydrogen System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Dryer Casing (primary)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Dryer Casing (secondary desiccant)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Filter Housing (primary desiccant)	Pressure Boundary	Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
Filter Housing (primary)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Housing (primary)	Pressure Boundary	Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Filter Housing (secondary desiccant dryer afterfilter)	Pressure Boundary	Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
Filter Housing (secondary desiccant dryer prefilter)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Flexible Connection	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 3
Piping	Pressure Boundary	Copper Alloy	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air – Outdoor (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-174	3.3.1- 108	B
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	A
		Elastomer	Air – Dry (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-504	3.3.1- 085	A

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Elastomer	Air – Dry (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.AP-103	3.3.1- 096	A
			Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A
			Condensation (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-504	3.3.1- 085	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.AP-103	3.3.1- 096	A
		Galvanized Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Galvanized Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A
		Stainless Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (External)	Loss of Material	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B, 1

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
		Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A
	Structural Integrity	Copper Alloy	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air – Outdoor (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	A, 3
		Galvanized Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Galvanized Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 3
		Stainless Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 3
		Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 3
Piping and Piping Components	Pressure Boundary	Galvanized Steel	Condensation (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A, 4
	Structural Integrity	Galvanized Steel	Condensation (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A, 4
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Waste Water (Internal)	None	None	VII.J.AP-277	3.3.1- 119	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 3
Silencer	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Tank (aftercooler drain accumulator)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 3
Tank (auxiliary building instrument air receiver)	Pressure Boundary	Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	C

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (auxiliary building instrument air receiver)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Tank (backup instrument air receiver)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Tank (evacuation air horn instrument air)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Tank (feedwater control valve accumulator)	Pressure Boundary	Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	C

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (feedwater control valve accumulator)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
Trap Body	Structural Integrity	Galvanized Steel	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 3
Valve Body	Pressure Boundary	Copper Alloy	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A
		Copper Alloy (>15% Zn)	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A, 2

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
		Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
	Structural Integrity	Copper Alloy	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A
		Copper Alloy (>15% Zn)	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A, 2
		Stainless Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
		Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A

Table 3.3.2-4 Auxiliary Systems - Instrument Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A

Plant Specific Notes:

1. Bubbler piping for fire water storage tank level indication has instrument air internal and raw water external within the tank. Flow blockage is not a concern for the internal air environment.
2. Cracking of copper alloy (>15% Zn) in indoor air could result from ammonia-based compounds conveyed to external surfaces from bolted joint leakage through insulation. However, cracking of internal surfaces is not expected as these surfaces are not exposed to contamination from external leakage sources.
3. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
4. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.3.2-5 Auxiliary Systems - Keowee Air Breaker System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Filter Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
Piping	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	A

Table 3.3.2-5 Auxiliary Systems - Keowee Air Breaker System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	A, 1
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A

Table 3.3.2-5 Auxiliary Systems - Keowee Air Breaker System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1
Tank (air breaker reservoir)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Tank (air compressor)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Valve Body	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A

Table 3.3.2-5 Auxiliary Systems - Keowee Air Breaker System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Copper Alloy	Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-6 Auxiliary Systems - Keowee Depressing Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Piping	Structural Integrity	Galvanized Steel	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
Valve Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A

Table 3.3.2-6 Auxiliary Systems - Keowee Depressing Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-7 Auxiliary Systems - Keowee Governor Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Heat Exchanger (air compressor aftercooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B, 1

Table 3.3.2-7 Auxiliary Systems - Keowee Governor Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A
	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A

Table 3.3.2-7 Auxiliary Systems - Keowee Governor Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
Tank (air receiver)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Trap Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A

Table 3.3.2-7 Auxiliary Systems - Keowee Governor Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A

Table 3.3.2-7 Auxiliary Systems - Keowee Governor Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Table 3.3.2-7 Auxiliary Systems - Keowee Governor Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-8 Auxiliary Systems - Keowee Station Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Heat Exchanger (air compressor aftercooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B,1
Piping	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Table 3.3.2-8 Auxiliary Systems - Keowee Station Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
Trap Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
Valve Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A

Table 3.3.2-8 Auxiliary Systems - Keowee Station Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-9 Auxiliary Systems - Nitrogen Purge and Blanket System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-9 Auxiliary Systems - Nitrogen Purge and Blanket System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
Flexible Connection	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
Piping	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	A
		Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A

Table 3.3.2-9 Auxiliary Systems - Nitrogen Purge and Blanket System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Elastomer	Gas (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-729	3.3.1- 085	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A

Table 3.3.2-9 Auxiliary Systems - Nitrogen Purge and Blanket System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A
Tank (low pressure nitrogen heater)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C
Valve Body	Pressure Boundary	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.AP-66	3.3.1- 009	A

Table 3.3.2-9 Auxiliary Systems - Nitrogen Purge and Blanket System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Copper Alloy (>15% Zn)	Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A
	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.AP-66	3.3.1- 009	A
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A

Table 3.3.2-9 Auxiliary Systems - Nitrogen Purge and Blanket System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A

Plant Specific Notes:

1. None.

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Filter Body	Pressure Boundary	Aluminum	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.A-451a	3.3.1- 189	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F2.A-763a	3.3.1- 234	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.A-451a	3.3.1- 189	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F2.A-763a	3.3.1- 234	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.A-451a	3.3.1- 189	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F2.A-763a	3.3.1- 234	A
Heat Exchanger (portable diesel compressor aftercooler) Tubes	Heat Transfer	Copper Alloy	Air – Outdoor (External)	Reduction of Heat Transfer	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-716	3.3.1- 151	A

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (portable diesel compressor aftercooler) Tubes	Heat Transfer	Copper Alloy	Condensation (Internal)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-565	3.3.1- 161	A
	Pressure Boundary	Copper Alloy	Air – Outdoor (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	C
Heat Exchanger (temporary diesel compressor aftercooler) Tubes	Heat Transfer	Copper Alloy	Air – Outdoor (External)	Reduction of Heat Transfer	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-716	3.3.1- 151	A
			Condensation (Internal)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-565	3.3.1- 161	A
	Pressure Boundary	Copper Alloy	Air – Outdoor (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	C
Piping	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Galvanized Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A
		Stainless Steel	Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Soil (External)	Cracking	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.A-425	3.3.1- 144	B
				Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-137	3.3.1- 107	B

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Galvanized Steel	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
		Stainless Steel	Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Waste Water (Internal)	None	None	VII.J.AP-277	3.3.1- 119	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
Strainer Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (portable diesel compressor oil separator)	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Tank (service air compressor separator)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Tank (service air receiver)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (temporary diesel compressor oil separator)	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Trap Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	A, 1

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-10 Auxiliary Systems - Service Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-11 Auxiliary Systems - Standby Shutdown Facility Fire Protection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Heat Exchanger (carbon dioxide evaporator / condenser) Tubes	Heat Transfer	Copper Alloy	Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
	Pressure Boundary	Copper Alloy	Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
Nozzle	Spray Pattern	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A, 1
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Fire Protection (B2.1.15)	VII.G.AP-150	3.3.1- 058	A
			Condensation (Internal)	Loss of Material	Fire Protection (B2.1.15)	VII.G.AP-150	3.3.1- 058	A

Table 3.3.2-11 Auxiliary Systems - Standby Shutdown Facility Fire Protection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	A
		Galvanized Steel	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Air – Indoor Uncontrolled (Internal)	None	None	VII.J.AP-13	3.3.1- 116	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Fire Protection (B2.1.15)	VII.G.AP-150	3.3.1- 058	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A
Tank (carbon dioxide storage)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Fire Protection (B2.1.15)	VII.G.AP-150	3.3.1- 058	C
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A

Table 3.3.2-11 Auxiliary Systems - Standby Shutdown Facility Fire Protection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Fire Protection (B2.1.15)	VII.G.AP-150	3.3.1- 058	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A

Plant Specific Notes:

1. Cracking of copper alloy (>15% Zn) in indoor air could result from ammonia-based compounds conveyed to external surfaces from bolted joint leakage through insulation. However, cracking of internal surfaces is not expected as these surfaces are not exposed to contamination from external leakage sources.

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Accumulator	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Accumulator	Structural Integrity	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Burette	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A
			Treated Borated Water (Internal)	None	None	VII.J.AP-52	3.3.1- 117	A
Flexible Connection	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Flow Restriction	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (pressurizer sample cooler) Coil	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.A3.AP-189	3.3.1- 046	A
Moisture Separator	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
	Structural Integrity	Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Elastomer	Treated Water (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.A4.AP-101	3.3.1- 085	A
		Polymeric	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	A
			Treated Water (Internal)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-797b	3.3.1- 263	A,1,3
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,6

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping and Piping Components	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,6
Pump Casing (caustic addition)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 3
					Selective Leaching (B2.1.21)	VII.E5.A-547	3.3.1- 072	A
Pump Casing (high pressure boric acid)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (high pressure boric acid)	Structural Integrity	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Pump Casing (hydrazine addition primary)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Pump Casing (hydrazine addition secondary)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (hydrazine addition secondary)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Pump Casing (lithium hydroxide addition)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (low pressure boric acid)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Pump Casing (normal and standby chemical addition)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (normal and standby chemical addition)	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Pump Casing (pressurizer chemical addition)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Pump Casing (secondary side amine addition)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (secondary side amine addition)	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Pump Casing (total dissolved gas sampling)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (zinc addition)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Sample Bomb	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sample Bomb	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A
			Treated Water (Internal)	None	None	VII.J.AP-51	3.3.1- 117	A
			Waste Water (Internal)	None	None	VII.J.AP-277	3.3.1- 119	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Strainer Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Tank (boric acid mixing)	Structural Integrity	Aluminum	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-762b	3.3.1- 233	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-774b	3.3.1- 245	A
			Air with Borated Water Leakage (External)	None	None	VII.J.A-777	3.3.1- 248	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-130	3.3.1- 025	C,2

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (boric acid mixing)	Structural Integrity	Aluminum	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VII.C2.AP-130	3.3.1- 025	C,2
Tank (cation exchange column)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-162	3.4.1- 083	A
					Water Chemistry (B2.1.2)	VIII.G.SP-162	3.4.1- 083	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-97	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-97	3.4.1- 011	A
Tank (caustic mixing)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (caustic mixing)	Structural Integrity	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Tank (gas collection container)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Tank (hydrazine drum)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (hydrazine drum)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-162	3.4.1- 083	A
					Water Chemistry (B2.1.2)	VIII.G.SP-162	3.4.1- 083	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-97	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-97	3.4.1- 011	A
Tank (hydrazine)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-162	3.4.1- 083	A
					Water Chemistry (B2.1.2)	VIII.G.SP-162	3.4.1- 083	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-97	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-97	3.4.1- 011	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (lithium hydroxide mix)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-162	3.4.1- 083	A
					Water Chemistry (B2.1.2)	VIII.G.SP-162	3.4.1- 083	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-97	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-97	3.4.1- 011	A
Tank (zinc addition fill)	Structural Integrity	Polymeric	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	C,4
			Treated Water (Internal)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-797b	3.3.1- 263	C,1,3
Trap Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Trap Body	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Treated Borated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	V.A.E-434	3.2.1- 090	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A,5
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A,5
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.3.2-12 Auxiliary Systems - Chemical Addition System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Plant Specific Notes:

1. GALL-SLR item VII.C1.A-797b includes treated water environment. The treated borated water is considered equivalent to treated water for polymeric components.
2. Material of construction is 5052 Aluminum which is not susceptible to stress corrosion cracking per NUREG 2192 Section 3.3.2.2.8.
3. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
4. Subject component is exposed to air with borated water leakage. No additional aging effects are identified for exposure of polymeric materials to borated water leakage.
5. The treated borated water environment is considered a match to the treated water environment for steel. General, crevice, and pitting corrosion occurs for steels in both treated water and treated borated water environments. Control of oxygen and contaminants in both environments mitigates crevice and pitting corrosion. General corrosion rates in a treated borated water environment are higher than in a treated water environment and is managed as long-term loss of material due to general corrosion.
6. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Flow Restriction	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Structural Integrity	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Heat Exchanger (quench tank cooler) Head	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (quench tank cooler) Head	Structural Integrity	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-118	3.3.1- 020	A
					Water Chemistry (B2.1.2)	VII.E1.AP-118	3.3.1- 020	A
Heat Exchanger (quench tank cooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.A3.AP-189	3.3.1- 046	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,3
	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,3
Pump Casing (component drain)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (component drain)	Structural Integrity	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Pump Casing (concentrated boric acid tank)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Pump Casing (quench tank drain)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (quench tank drain)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Pump Casing (reactor coolant bleed transfer A,B)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (reactor coolant bleed transfer A,B)	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A
			Treated Borated Water (Internal)	None	None	VII.J.AP-52	3.3.1- 117	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Tank ('A' reactor coolant bleed holdup)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank ('A' reactor coolant bleed holdup)	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Tank ('B' reactor coolant bleed holdup)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-162	3.4.1- 083	A
					Water Chemistry (B2.1.2)	VIII.G.SP-162	3.4.1- 083	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-97	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-97	3.4.1- 011	A
Tank (concentrated boric acid)	Structural Integrity	Aluminum	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-762b	3.3.1- 233	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (concentrated boric acid)	Structural Integrity	Aluminum	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-774b	3.3.1- 245	A
			Air with Borated Water Leakage (External)	None	None	VII.J.A-777	3.3.1- 248	A
			Gas (Internal)	None	None	VII.J.AP-37	3.3.1- 113	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-130	3.3.1- 025	C,1
					Water Chemistry (B2.1.2)	VII.C2.AP-130	3.3.1- 025	C,1
Tank (deborating demineralizer)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (quench)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A
			Treated Borated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	V.A.E-434	3.2.1- 090	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A,2
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A,2

Table 3.3.2-13 Auxiliary Systems - Coolant Storage System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Material of construction is 5052 Aluminum which is not susceptible to stress corrosion cracking per NUREG 2192 Section 3.3.2.2.8.
2. The treated borated water environment is considered a match to the treated water environment for steel. General, crevice, and pitting corrosion occurs for steels in both treated water and treated borated water environments. Control of oxygen and contaminants in both environments mitigates crevice and pitting corrosion. General corrosion rates in a treated borated water environment are higher than in a treated water environment and is managed as long-term loss of material due to general corrosion.
3. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.3.2-14 Auxiliary Systems - Coolant Treatment System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Piping	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A

Table 3.3.2-14 Auxiliary Systems - Coolant Treatment System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Pump Casing (condensate test tank)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A

Table 3.3.2-14 Auxiliary Systems - Coolant Treatment System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (condensate test tank)	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Tank (condensate test)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-162	3.4.1- 083	A
					Water Chemistry (B2.1.2)	VIII.G.SP-162	3.4.1- 083	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-97	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-97	3.4.1- 011	A
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-14 Auxiliary Systems - Coolant Treatment System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-15 Auxiliary Systems - Demineralized Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-15 Auxiliary Systems - Demineralized Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
Flow Element	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A

Table 3.3.2-15 Auxiliary Systems - Demineralized Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
	Structural Integrity	Aluminum	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A4.A-763a	3.3.1- 234	A,1
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-130	3.3.1- 025	A,1
					Water Chemistry (B2.1.2)	VII.C2.AP-130	3.3.1- 025	A,1
		PVC	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-268	3.3.1- 119	A
			Treated Water (Internal)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C2.A-797b	3.3.1- 263	A,2,3
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-15 Auxiliary Systems - Demineralized Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A

Table 3.3.2-15 Auxiliary Systems - Demineralized Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy (>15% Zn)	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	A
					Selective Leaching (B2.1.21)	VII.C2.AP-32	3.3.1- 072	A
					Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-15 Auxiliary Systems - Demineralized Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Plant Specific Notes:

1. DW piping is Aluminum 6061-T6, which is not susceptible to SCC
2. NUREG-2191 identifies no aging effects for PVC in a raw (potable) environment. The treated water environment is demineralized water that contains no additives. This environment is considered a match to raw (potable) for the subject material-environment-aging effect combination.
3. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-16 Auxiliary Systems - Essential Siphon Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Underground (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-243	3.3.1- 108	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Underground (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-241	3.3.1- 109	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A

Table 3.3.2-16 Auxiliary Systems - Essential Siphon Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,2
			Soil (External)	Cracking	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.A-425	3.3.1- 144	B
				Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-137	3.3.1- 107	B
			Underground (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-714a	3.3.1- 146	A

Table 3.3.2-16 Auxiliary Systems - Essential Siphon Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Underground (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-775a	3.3.1- 246	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B, 2
Pump Casing (essential siphon vacuum)	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-16 Auxiliary Systems - Essential Siphon Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (essential siphon vacuum)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
Separator (essential siphon vacuum air-water)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Sight Glass	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A,1
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A,1
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A,1
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A,1

Table 3.3.2-16 Auxiliary Systems - Essential Siphon Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Pressure Boundary	Stainless Steel	Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,1,2
Silencer	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Tank (essential siphon vacuum receiver)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	C,2
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-16 Auxiliary Systems - Essential Siphon Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Underground (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-714a	3.3.1- 146	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-775a	3.3.1- 246	A

Plant Specific Notes:

1. The ESV vacuum tank level gauge is a magnetic float type indicator with no glass element.
2. Flow blockage is not a concern in the ESV system as the raw water environment is only present in drain piping which is not part of the main flow path.

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Accumulator	Pressure Boundary	Elastomer	Air (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E1.A-504	3.3.1- 085	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-76	3.3.1- 096	A
			Treated Borated Water (External)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.A3.AP-100	3.3.1- 085	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Accumulator	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Borated Water (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-423	3.3.1- 142	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Treated Borated Water >60°C (>140°F) (External)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	C
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Filter Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Body	Structural Integrity	Polymeric	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	A
			Treated Borated Water (Internal)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-797b	3.3.1- 263	A,1,2
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Flexible Connection	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Pressure Boundary	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
Heat Exchanger (spent fuel cooler A,B) Head	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	C

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (spent fuel cooler A,B) Head	Pressure Boundary	Stainless Steel	Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.E3.AP-192	3.3.1- 044	A
Heat Exchanger (spent fuel cooler A,B) Shell	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-118	3.3.1- 020	A
					Water Chemistry (B2.1.2)	VII.E1.AP-118	3.3.1- 020	A
Heat Exchanger (spent fuel cooler A,B) Tubes	Heat Transfer	Stainless Steel	Closed-Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-188	3.3.1- 050	A
			Treated Borated Water (External)	Reduction of Heat Transfer	One-Time Inspection (B2.1.20)	VII.A3.A-101	3.3.1- 017	A
					Water Chemistry (B2.1.2)	VII.A3.A-101	3.3.1- 017	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (spent fuel cooler A,B) Tubes	Pressure Boundary	Stainless Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	C
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.E3.AP-192	3.3.1- 044	A
			Treated Borated Water (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C
			Treated Borated Water >60°C (>140°F) (External)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-118	3.3.1- 020	A
					Water Chemistry (B2.1.2)	VII.E1.AP-118	3.3.1- 020	A
Heat Exchanger (spent fuel cooler A,B) Tubesheet	Pressure Boundary	Stainless Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	C
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.E3.AP-192	3.3.1- 044	A
			Treated Borated Water (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (spent fuel cooler A,B) Tubesheet	Pressure Boundary	Stainless Steel	Treated Borated Water >60°C (>140°F) (External)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-118	3.3.1- 020	A
					Water Chemistry (B2.1.2)	VII.E1.AP-118	3.3.1- 020	A
Heat Exchanger (spent fuel cooler C) Nozzle	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-118	3.3.1- 020	A
					Water Chemistry (B2.1.2)	VII.E1.AP-118	3.3.1- 020	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (spent fuel cooler C) Nozzle	Pressure Boundary	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.A3.AP-189	3.3.1- 046	A
Heat Exchanger (spent fuel cooler C) Plate	Heat Transfer	Stainless Steel	Closed-Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-188	3.3.1- 050	C
			Treated Borated Water (Internal)	Reduction of Heat Transfer	One-Time Inspection (B2.1.20)	VII.A3.A-101	3.3.1- 017	C
					Water Chemistry (B2.1.2)	VII.A3.A-101	3.3.1- 017	C
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	C
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.E3.AP-192	3.3.1- 044	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (spent fuel cooler C) Plate	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-118	3.3.1- 020	A
					Water Chemistry (B2.1.2)	VII.E1.AP-118	3.3.1- 020	A
Heat Exchanger (spent fuel cooler C) Tie Rod	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Orifice	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.A-98	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.A-98	3.3.1- 125	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated Water >60°C (>140°F) (External)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Pump Casing (borated water recirculation)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (borated water recirculation)	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Pump Casing (priming)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (priming)	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Pump Casing (reverse osmosis feed booster)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
Pump Casing (reverse osmosis feed)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (spent fuel cooling)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A
			Treated Borated Water (Internal)	None	None	VII.J.AP-52	3.3.1- 117	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Tank (incore instrumentation handling)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (incore instrumentation handling)	Structural Integrity	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Tank (spent fuel demineralizer)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Tank (spent fuel priming)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	C

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (spent fuel priming)	Structural Integrity	Stainless Steel	Treated Borated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	C
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.A-98	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.A-98	3.3.1- 125	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated Water >60°C (>140°F) (External)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A

Table 3.3.2-17 Auxiliary Systems - Spent Fuel Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Borated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.AP-79	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.AP-79	3.3.1- 125	A
			Treated Borated water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.E1.AP-82	3.3.1- 028	A
					Water Chemistry (B2.1.2)	VII.E1.AP-82	3.3.1- 028	A

Plant Specific Notes:

1. GALL-SLR item VII.C1.A-797b includes treated water environment. The treated borated water is considered equivalent to treated water for polymeric components.
2. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-18 Auxiliary Systems - Alternate Chilled Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Flexible Connection	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A

Table 3.3.2-18 Auxiliary Systems - Alternate Chilled Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (alternate chiller 1,2 condenser) Fins	Heat Transfer	Aluminum	Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A
				Reduction of Heat Transfer	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-716	3.3.1- 151	C
Heat Exchanger (alternate chiller 1,2 condenser) Tubes	Heat Transfer	Copper Alloy	Air – Outdoor (External)	Reduction of Heat Transfer	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-716	3.3.1- 151	A
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
	Pressure Boundary	Copper Alloy	Air – Outdoor (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
Heat Exchanger (alternate chiller 1,2 evaporator) Head	Pressure Boundary	Gray Cast Iron	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-40	3.3.1- 080	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
					Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	C

Table 3.3.2-18 Auxiliary Systems - Alternate Chilled Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (alternate chiller 1,2 evaporator) Shell	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-40	3.3.1- 080	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C
Heat Exchanger (alternate chiller 1,2 evaporator) Tubes	Heat Transfer	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-205	3.3.1- 050	A
			Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
	Pressure Boundary	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.F1.AP-203	3.3.1- 046	A
			Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
Heat Exchanger (alternate chiller 1,2 evaporator) Tubesheet	Pressure Boundary	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
			Gas (External)	None	None	VII.J.AP-6	3.3.1- 121	C
Hose (stored equipment)	Pressure Boundary	Aluminum	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.A-451a	3.3.1- 189	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-763a	3.3.1- 234	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.A-451a	3.3.1- 189	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-763a	3.3.1- 234	A

Table 3.3.2-18 Auxiliary Systems - Alternate Chilled Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Hose (stored equipment)	Pressure Boundary	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Air – Indoor Uncontrolled (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A, 1
		Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A
			Air – Indoor Uncontrolled (Internal)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A, 3
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A, 3
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A

Table 3.3.2-18 Auxiliary Systems - Alternate Chilled Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Outdoor (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A

Table 3.3.2-18 Auxiliary Systems - Alternate Chilled Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Pump Casing (alternate chiller 1,2)	Pressure Boundary	Gray Cast Iron	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A

Table 3.3.2-18 Auxiliary Systems - Alternate Chilled Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (alternate chiller 1,2)	Pressure Boundary	Gray Cast Iron	Closed-Cycle Cooling Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	A
Strainer Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A
		Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Strainer Screen	Filtration	Stainless Steel	Closed-Cycle Cooling Water (External)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Raw Water (Potable) (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A

Table 3.3.2-18 Auxiliary Systems - Alternate Chilled Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (air separator)	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Tank (captive air expansion)	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Tank (chemical addition)	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Tank Bladder (captive air expansion)	Pressure Boundary	Elastomer	Air (External)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-504	3.3.1- 085	C, 2

Table 3.3.2-18 Auxiliary Systems - Alternate Chilled Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank Bladder (captive air expansion)	Pressure Boundary	Elastomer	Air (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.AP-103	3.3.1- 096	C, 2
			Closed-Cycle Cooling Water (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C2.AP-259	3.3.1- 085	A
Valve Body	Pressure Boundary	Copper Alloy	Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-271	3.3.1- 093	A
		Ductile Iron	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
					Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	A
		Gray Cast Iron	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A

Table 3.3.2-18 Auxiliary Systems - Alternate Chilled Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Gray Cast Iron	Closed-Cycle Cooling Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A

Table 3.3.2-18 Auxiliary Systems - Alternate Chilled Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A

Plant Specific Notes:

1. Cracking of copper alloy (>15% Zn) in indoor air could result from ammonia-based compounds conveyed to external surfaces from bolted joint leakage through insulation. However, cracking of internal surfaces is not expected as these surfaces are not exposed to contamination from external leakage sources.
2. External surface of tank bladder is located inside of the tank. Therefore, the inspection is performed inside of the tank.
3. Hose is stored in a cabinet or trailer and protected from system leakage. Inspection of the external surface is representative of the internal surface.

Table 3.3.2-19 Auxiliary Systems - Component Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-19 Auxiliary Systems - Component Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Flexible Connection	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A

Table 3.3.2-19 Auxiliary Systems - Component Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
Heat Exchanger (component cooler) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B, 1
Heat Exchanger (component cooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-19 Auxiliary Systems - Component Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (component cooler) Shell	Structural Integrity	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A

Table 3.3.2-19 Auxiliary Systems - Component Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Piping and Piping Components	Pressure Boundary	Steel	Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A,2
	Structural Integrity	Stainless Steel	Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,2
		Steel	Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A,2

Table 3.3.2-19 Auxiliary Systems - Component Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (component cooling)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Pump Casing (drain tank)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
					Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	A
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A
			Closed-Cycle Cooling Water (Internal)	None	None	VII.J.AP-166	3.3.1- 117	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A

Table 3.3.2-19 Auxiliary Systems - Component Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
Tank (chemical addition)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Tank (drain)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	C

Table 3.3.2-19 Auxiliary Systems - Component Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (drain)	Structural Integrity	Stainless Steel	Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	C
Tank (surge)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-19 Auxiliary Systems - Component Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A

Table 3.3.2-19 Auxiliary Systems - Component Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
2. The terminology "Piping and Piping Components" represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.3.2-20 Auxiliary Systems - Chilled Water (Non-Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Condensation (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Condensation (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A

Table 3.3.2-20 Auxiliary Systems - Chilled Water (Non-Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Flow Restriction	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
	Pressure Boundary	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
	Structural Integrity	Stainless Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
Heat Exchanger (C/D chiller condenser) Head	Structural Integrity	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-417	3.3.1- 096b	A

Table 3.3.2-20 Auxiliary Systems - Chilled Water (Non-Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (C/D chiller condenser) Head	Structural Integrity	Steel	Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B, 2
Heat Exchanger (C/D chiller condenser) Shell	Structural Integrity	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-417	3.3.1- 096b	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C
Heat Exchanger (C/D chiller cooler) Head	Structural Integrity	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-417	3.3.1- 096b	A
Heat Exchanger (C/D chiller cooler) Shell	Structural Integrity	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-417	3.3.1- 096b	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C
Orifice	Structural Integrity	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A

Table 3.3.2-20 Auxiliary Systems - Chilled Water (Non-Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Structural Integrity	Steel	Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A
Piping	Pressure Boundary	Stainless Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
		Stainless Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A

Table 3.3.2-20 Auxiliary Systems - Chilled Water (Non-Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Condensation (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
Pump Casing (chilled water booster)	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
Pump Casing (primary chilled water)	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
Pump Casing (secondary distribution)	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
Sight Glass	Structural Integrity	Glass	Closed-Cycle Cooling Water (Internal)	None	None	VII.J.AP-166	3.3.1- 117	A

Table 3.3.2-20 Auxiliary Systems - Chilled Water (Non-Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Glass	Condensation (External)	None	None	VII.J.AP-97	3.3.1- 117	A
		Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
Strainer Body	Pressure Boundary	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
	Structural Integrity	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
Strainer Screen	Filtration	Stainless Steel	Closed-Cycle Cooling Water (External)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A

Table 3.3.2-20 Auxiliary Systems - Chilled Water (Non-Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (compression)	Structural Integrity	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
Valve Body	Pressure Boundary	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
		Copper Alloy (>15% Zn)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.AP-66	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.A-473a	3.3.1- 160	A
				Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A, 1
			Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
		Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A

Table 3.3.2-20 Auxiliary Systems - Chilled Water (Non-Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
		Copper Alloy (>15% Zn)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.AP-66	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.A-473a	3.3.1- 160	A
				Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A, 1

Table 3.3.2-20 Auxiliary Systems - Chilled Water (Non-Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy (>15% Zn)	Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
		Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A

Plant Specific Notes:

1. Material of construction is inhibited Brass which is not susceptible to selective leaching.
2. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Eductor	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Expansion Joint	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Flexible Connection	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
Heat Exchanger (U0 recirculating cooling water A,B,C,D) Head	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (U0 recirculating cooling water A,B,C,D) Head	Pressure Boundary	Steel	Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B
Heat Exchanger (U0 recirculating cooling water A,B,C,D) Shell	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
Heat Exchanger (U0 recirculating cooling water A,B,C,D) Tubes	Heat Transfer	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (External)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-205	3.3.1- 050	A
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-187	3.3.1- 042	B
	Pressure Boundary	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (External)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.A-473a	3.3.1- 160	A
				Loss of Material	Closed Treated Water System (B2.1.12)	VII.F1.AP-203	3.3.1- 046	A, 2
			Raw Water (Internal)	Cracking	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-473b	3.3.1- 160	B
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B, 2

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (U0 recirculating cooling water A,B,C,D) Tubesheet	Pressure Boundary	Steel	Closed-Cycle Cooling Water (External)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B
Heat Exchanger (U3 recirculating cooling water 3A,3B) Cover	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B
Heat Exchanger (U3 recirculating cooling water 3A,3B) Plate	Heat Transfer	Stainless Steel	Closed-Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-188	3.3.1- 050	C
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-187	3.3.1- 042	B, 1
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	C

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (U3 recirculating cooling water 3A,3B) Plate	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	C
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.E3.AP-192	3.3.1- 044	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	D
Orifice	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Pump Casing (recirculating cooling water)	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
					Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	A
Sight Glass	Pressure Boundary	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Closed-Cycle Cooling Water (Internal)	None	None	VII.J.AP-166	3.3.1- 117	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Glass	Closed-Cycle Cooling Water (Internal)	None	None	VII.J.AP-166	3.3.1- 117	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Tank (chemical addition)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Tank (recirculating cooling water surge)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C
Valve Body	Pressure Boundary	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.A-473a	3.3.1- 160	A

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A
					Selective Leaching (B2.1.21)	VII.C2.AP-43	3.3.1- 072	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
	Structural Integrity	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.A-473a	3.3.1- 160	A

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A
					Selective Leaching (B2.1.21)	VII.C2.AP-43	3.3.1- 072	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A

Table 3.3.2-21 Auxiliary Systems - Recirculating Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. The heat exchanger plate performs the same function as a heat exchanger tube. Therefore, the component type is equivalent.
2. Material of construction is inhibited Brass which is not susceptible to selective leaching.

Table 3.3.2-22 Auxiliary Systems - Sample Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Heat Exchanger (chiller condenser) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
Heat Exchanger (chiller condenser) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C
Heat Exchanger (chiller evaporator) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C

Table 3.3.2-22 Auxiliary Systems - Sample Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (chiller evaporator) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Raw Water (Potable) (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	C, 1
Piping	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Potable) (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A, 1
Pump Casing (chilled water)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Potable) (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A

Table 3.3.2-22 Auxiliary Systems - Sample Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (chilled water)	Structural Integrity	Gray Cast Iron	Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A, 1
					Selective Leaching (B2.1.21)	VII.G.A-51	3.3.1- 072	A
Tank (sample cooling water surge)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Potable) (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	C, 1
Valve Body	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-271	3.3.1- 093	A

Table 3.3.2-22 Auxiliary Systems - Sample Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy (>15% Zn)	Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-271	3.3.1- 093	A
					Selective Leaching (B2.1.21)	VII.G.A-47	3.3.1- 072	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C2.AP-221a	3.3.1- 006	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Potable) (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A, 1

Table 3.3.2-22 Auxiliary Systems - Sample Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Condensation (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Condensation (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Condensation (External)	Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Flow Element	Flow Restriction	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
	Pressure Boundary	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (A/B chiller condenser) Fins	Heat Transfer	Copper Alloy	Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
Heat Exchanger (A/B chiller condenser) Head	Pressure Boundary	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-417	3.3.1- 096b	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B
Heat Exchanger (A/B chiller condenser) Shell	Pressure Boundary	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-417	3.3.1- 096b	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C
Heat Exchanger (A/B chiller condenser) Tubes	Heat Transfer	Copper Alloy	Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-187	3.3.1- 042	B
	Pressure Boundary	Copper Alloy	Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (A/B chiller condenser) Tubesheet	Pressure Boundary	Steel	Gas (External)	None	None	VII.J.AP-6	3.3.1- 121	C
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B
Heat Exchanger (A/B chiller evaporator) Fins	Heat Transfer	Copper Alloy	Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
Heat Exchanger (A/B chiller evaporator) Head	Pressure Boundary	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-417	3.3.1- 096b	A
Heat Exchanger (A/B chiller evaporator) Shell	Pressure Boundary	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-417	3.3.1- 096b	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C
Heat Exchanger (A/B chiller evaporator) Tubes	Heat Transfer	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-205	3.3.1- 050	A
			Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (A/B chiller evaporator) Tubes	Pressure Boundary	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.F1.AP-203	3.3.1- 046	A
			Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
Heat Exchanger (A/B chiller evaporator) Tubesheet	Pressure Boundary	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
			Gas (External)	None	None	VII.J.AP-6	3.3.1- 121	C
Heat Exchanger (temporary chiller condenser) Fins	Heat Transfer	Aluminum	Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A
				Reduction of Heat Transfer	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-716	3.3.1- 151	C
Heat Exchanger (temporary chiller condenser) Tubes	Heat Transfer	Copper Alloy	Air – Outdoor (External)	Reduction of Heat Transfer	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-716	3.3.1- 151	A
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
	Pressure Boundary	Copper Alloy	Air – Outdoor (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (temporary chiller evaporator) Head	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-40	3.3.1- 080	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,2
Heat Exchanger (temporary chiller evaporator) Shell	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-40	3.3.1- 080	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C
Heat Exchanger (temporary chiller evaporator) Tubes	Heat Transfer	Copper Alloy	Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
			Raw Water (Internal)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-736	3.3.1- 207	A,1
	Pressure Boundary	Copper Alloy	Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (temporary chiller evaporator) Tubes	Pressure Boundary	Copper Alloy	Raw Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,1
Heat Exchanger (temporary chiller evaporator) Tubesheet	Pressure Boundary	Steel	Gas (External)	None	None	VII.J.AP-6	3.3.1- 121	C
			Raw Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,1,2
Orifice	Flow Restriction	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A
	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Pressure Boundary	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A
Piping	Pressure Boundary	Polymeric	Air – Outdoor (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering, Flow Blockage	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	A
			Closed-Cycle Cooling Water (Internal)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	None	None	G
			Condensation (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering, Flow Blockage	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Polymeric	Closed-Cycle Cooling Water (Internal)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	None	None	G
			Condensation (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	A, 3
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
Pump Casing (chilled water)	Pressure Boundary	Gray Cast Iron	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
					Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
Sight Glass	Pressure Boundary	Glass	Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Pressure Boundary	Glass	Closed-Cycle Cooling Water (Internal)	None	None	VII.J.AP-166	3.3.1- 117	A
			Condensation (External)	None	None	VII.J.AP-97	3.3.1- 117	A
		Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
	Structural Integrity	Glass	Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A
			Closed-Cycle Cooling Water (Internal)	None	None	VII.J.AP-166	3.3.1- 117	A
			Condensation (External)	None	None	VII.J.AP-97	3.3.1- 117	A
		Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
Strainer Body	Pressure Boundary	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Pressure Boundary	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
Strainer Screen	Filtration	Stainless Steel	Closed-Cycle Cooling Water (External)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
Tank (chemical feeder)	Structural Integrity	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
Tank (makeup water 15 gallons)	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	C
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
Tank (makeup water 48 gallons)	Pressure Boundary	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	C
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (makeup water 48 gallons)	Pressure Boundary	Stainless Steel	Condensation (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
Valve Body	Pressure Boundary	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
		Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-199	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
		Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A

Table 3.3.2-23 Auxiliary Systems - Chilled Water (Vital Loads) System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. The temporary chiller tubes and tubesheet are periodically exposed to closed-cycle cooling water and raw water depending on the chiller service. Therefore, the Inspection of Internal Surfaces AMP is used rather than the Open-Cycle Cooling Water AMP.
2. The temporary chiller tubes and tubesheet are exposed to raw water only when used for Reactor Building cooling during outages. Otherwise, the environment is closed-cycle cooling water when in WC service or nitrogen gas when stored. Therefore, long-term loss of material due to exposure to raw water is not an aging effect requiring management.
3. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Condensation (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Underground (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-243	3.3.1- 108	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Steel	Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-241	3.3.1- 109	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Underground (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-241	3.3.1- 109	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Condensation (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Expansion Joint	Pressure Boundary	Elastomer	Condensation (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Pressure Boundary	Elastomer	Raw Water (Internal)	Hardening or Loss of Strength, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-75	3.3.1- 085	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-76	3.3.1- 096	A
		Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
Filter Body	Pressure Boundary	Gray Cast Iron	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Body	Pressure Boundary	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
Fire Hydrant	Pressure Boundary	Ductile Iron	Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.AP-149	3.3.1- 063	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-198	3.3.1- 109	B
					Selective Leaching (B2.1.21)	VII.C1.A-02	3.3.1- 072	A
		Gray Cast Iron	Air – Outdoor (External)	Loss of Material	Fire Water System (B2.1.16)	VII.G.AP-149	3.3.1- 063	B
			Air – Outdoor (Internal)	Loss of Material	Fire Water System (B2.1.16)	VII.G.AP-149	3.3.1- 063	B
Flow Element	Flow Restriction	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Flow Restriction	Stainless Steel	Condensation (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B
	Pressure Boundary	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B
Heat Exchanger (high pressure service water motor air cooler) Fins	Heat Transfer	Aluminum	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A
				Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Heat Exchanger (high pressure service water motor air cooler) Head	Pressure Boundary	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (high pressure service water motor air cooler) Head	Pressure Boundary	Steel	Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	D
Heat Exchanger (high pressure service water motor air cooler) Tubes	Heat Transfer	Copper Alloy	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A
			Raw Water (Internal)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-736	3.3.1- 207	A
	Pressure Boundary	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.AP-197	3.3.1- 064	D
Orifice	Flow Restriction	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B
	Pressure Boundary	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Pressure Boundary	Stainless Steel	Condensation (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B
	Structural Integrity	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,2
Piping	Pressure Boundary	Ductile Iron (w. Cement Lining)	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Ductile Iron (w. Cement Lining)	Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VII.G.A-416	3.3.1- 138	B
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VII.C1.A-415	3.3.1- 140	B
						VII.G.A-414	3.3.1- 139	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-198	3.3.1- 109	B
					Selective Leaching (B2.1.21)	VII.G.A-02	3.3.1- 072	A
		Galvanized Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
		Stainless Steel	Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Outdoor (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B
			Underground (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-714a	3.3.1- 146	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-775a	3.3.1- 246	A
		Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Air – Outdoor (Internal)	Loss of Material	Fire Water System (B2.1.16)	VII.G.A-722	3.3.1- 157	B
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Fire Water System (B2.1.16)	VII.G.AP-143	3.3.1- 089	B

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
			Underground (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-284	3.3.1- 109	B
	Structural Integrity	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,2
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.G.A-649	3.3.1- 197	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,2
					Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
Pump Casing (high pressure service water jockey)	Pressure Boundary	Gray Cast Iron	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
Pump Casing (high pressure service water)	Pressure Boundary	Gray Cast Iron	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sprinkler Head	Pressure Boundary	Copper Alloy (>15% Zn)	Air – Outdoor (External)	Loss of Material	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
			Air – Outdoor (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.AP-66	3.3.1- 009	C
			Condensation (External)	Loss of Material	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
			Condensation (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
			Raw Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-47	3.3.1- 072	C
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
	Spray Pattern	Copper Alloy (>15% Zn)	Air – Outdoor (External)	Loss of Material	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
			Air – Outdoor (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
			Condensation (External)	Loss of Material	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
			Condensation (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sprinkler Head	Structural Integrity	Copper Alloy (>15% Zn)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.AP-66	3.3.1- 009	C
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.G.A-649	3.3.1- 197	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,2
					Selective Leaching (B2.1.21)	VII.C1.A-47	3.3.1- 072	C
Strainer Body	Pressure Boundary	Gray Cast Iron	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
	Structural Integrity	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Structural Integrity	Stainless Steel	Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,2
Strainer Screen	Filtration	Stainless Steel	Raw Water (External)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B
Tank (elevated water storage)	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	Fire Water System (B2.1.16)	VII.G.A-412	3.3.1- 136	B
		Steel with Internal Coating/Lining	Raw Water (Internal)	Loss of Coating or Lining Integrity	Fire Water System (B2.1.16)	VII.C1.A-416	3.3.1- 138	E, 1
				Loss of Material	Fire Water System (B2.1.16)	VII.G.A-414	3.3.1- 139	E, 1
Valve Body	Pressure Boundary	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.AP-197	3.3.1- 064	B
		Copper Alloy (>15% Zn)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.AP-66	3.3.1- 009	A
			Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-47	3.3.1- 072	A

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Copper Alloy (>15% Zn)	Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.AP-197	3.3.1- 064	B
		Ductile Iron	Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-198	3.3.1- 109	B
					Selective Leaching (B2.1.21)	VII.C3.A-02	3.3.1- 072	A
		Gray Cast Iron	Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-198	3.3.1- 109	B
					Selective Leaching (B2.1.21)	VII.C3.A-02	3.3.1- 072	A
		Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Condensation (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-137	3.3.1- 107	B
			Underground (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-714a	3.3.1- 146	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-775a	3.3.1- 246	A
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-198	3.3.1- 109	B
			Underground (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-284	3.3.1- 109	B

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,2
		Copper Alloy (>15% Zn)	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.AP-66	3.3.1- 009	A
			Condensation (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,2
					Selective Leaching (B2.1.21)	VII.C1.A-47	3.3.1- 072	A
		Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-24 Auxiliary Systems - High Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,2
		Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.G.A-649	3.3.1- 197	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,2

Plant Specific Notes:

1. The EWST is internally coated/lined
2. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-25 Auxiliary Systems - Keowee Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Condensation (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Condensation (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Heat Exchanger (equipment gallery air handling unit) Head	Structural Integrity	Gray Cast Iron	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.G.A-649	3.3.1- 197	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B,1
					Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
Heat Exchanger (equipment gallery air handling unit) Tubes	Structural Integrity	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B,1

Table 3.3.2-25 Auxiliary Systems - Keowee Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Galvanized Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.G.A-649	3.3.1- 197	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
		PVC	Condensation (External)	None	None	VII.J.AP-269	3.3.1- 119	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-787c	3.3.1- 253	A,1
		Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.G.A-649	3.3.1- 197	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
						VII.C1.AP-194	3.3.1- 037	B,1

Table 3.3.2-25 Auxiliary Systems - Keowee Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (sodium hypochlorite metering)	Structural Integrity	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
Strainer Body	Structural Integrity	Gray Cast Iron	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.G.A-649	3.3.1- 197	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
					Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
Tank (chlorine)	Structural Integrity	Polymeric	Condensation (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	C
			Raw Water (Internal)	Cracking, Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-739	3.3.1- 210	C, 1

Table 3.3.2-25 Auxiliary Systems - Keowee Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-196	3.3.1- 034	B,1
		PVC	Condensation (External)	None	None	VII.J.AP-269	3.3.1- 119	A
			Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-787c	3.3.1- 253	A,1
		Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
		Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.G.A-649	3.3.1- 197	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1

Table 3.3.2-25 Auxiliary Systems - Keowee Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-26 Auxiliary Systems - Keowee Fire Detection/Protection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Condensation (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Condensation (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-241	3.3.1- 109	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Condensation (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A

Table 3.3.2-26 Auxiliary Systems - Keowee Fire Detection/Protection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Steel	Condensation (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Fire Hydrant	Pressure Boundary	Ductile Iron	Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.AP-149	3.3.1- 063	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-198	3.3.1- 109	B
					Selective Leaching (B2.1.21)	VII.C1.A-02	3.3.1- 072	A
		Gray Cast Iron	Air – Outdoor (External)	Loss of Material	Fire Water System (B2.1.16)	VII.G.AP-149	3.3.1- 063	B
			Air – Outdoor (Internal)	Loss of Material	Fire Water System (B2.1.16)	VII.G.AP-149	3.3.1- 063	B
Flow Element	Flow Restriction	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B

Table 3.3.2-26 Auxiliary Systems - Keowee Fire Detection/Protection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Pressure Boundary	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B
Piping	Pressure Boundary	Ductile Iron (w. Cement Lining)	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
				Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VII.G.A-416	3.3.1- 138	B
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VII.C1.A-415	3.3.1- 140	B
						VII.G.A-414	3.3.1- 139	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-198	3.3.1- 109	B

Table 3.3.2-26 Auxiliary Systems - Keowee Fire Detection/Protection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Ductile Iron (w. Cement Lining)	Soil (External)	Loss of Material	Selective Leaching (B2.1.21)	VII.G.A-02	3.3.1- 072	A
		Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B
		Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Fire Water System (B2.1.16)	VII.G.AP-143	3.3.1- 089	B
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
	Structural Integrity	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.G.A-649	3.3.1- 197	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A

Table 3.3.2-26 Auxiliary Systems - Keowee Fire Detection/Protection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,1
					Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
Pump Casing (fire protection)	Pressure Boundary	Gray Cast Iron	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
Sprinkler Head	Pressure Boundary	Copper Alloy (>15% Zn)	Condensation (External)	Loss of Material	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
			Condensation (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
	Spray Pattern	Copper Alloy (>15% Zn)	Condensation (External)	Loss of Material	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B
			Condensation (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-403	3.3.1- 130	B

Table 3.3.2-26 Auxiliary Systems - Keowee Fire Detection/Protection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Pressure Boundary	Gray Cast Iron	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
Strainer Screen	Filtration	Stainless Steel	Raw Water (External)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B
Valve Body	Pressure Boundary	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.AP-197	3.3.1- 064	B
		Gray Cast Iron	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B

Table 3.3.2-26 Auxiliary Systems - Keowee Fire Detection/Protection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Gray Cast Iron	Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-198	3.3.1- 109	B
					Selective Leaching (B2.1.21)	VII.C1.A-02	3.3.1- 072	A
		Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-55	3.3.1- 066	B
		Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Fire Water System (B2.1.16)	VII.G.A-33	3.3.1- 064	B
	Structural Integrity	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.G.A-649	3.3.1- 197	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A

Table 3.3.2-26 Auxiliary Systems - Keowee Fire Detection/Protection System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Raw Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-727	3.3.1- 134	A,1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-27 Auxiliary Systems - Reactor Building Cooling and Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Cracking, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Cracking, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Cooling Coil (reactor building cooling units) Casing	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A

Table 3.3.2-27 Auxiliary Systems - Reactor Building Cooling and Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (reactor building cooling units) Casing	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
Cooling Coil (reactor building cooling units) Fins	Heat Transfer	Copper Alloy	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Cooling Coil (reactor building cooling units) Head	Pressure Boundary	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	D

Table 3.3.2-27 Auxiliary Systems - Reactor Building Cooling and Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (reactor building cooling units) Tubes	Heat Transfer	Copper Alloy	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-187	3.3.1- 042	B
	Pressure Boundary	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B
Drain Pan	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,1
Ducting	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-27 Auxiliary Systems - Reactor Building Cooling and Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Ducting	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Expansion Joint	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
Fan Casing (reactor building cooling units)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C

Table 3.3.2-27 Auxiliary Systems - Reactor Building Cooling and Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Fan Casing (reactor building cooling units)	Pressure Boundary	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Piping	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-28 Auxiliary Systems - Reactor Building Purge System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Cracking, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Cracking, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Ducting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A

Table 3.3.2-28 Auxiliary Systems - Reactor Building Purge System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Ducting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
Heating Coil (purge supply unit) Head	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Selective Leaching (B2.1.21)	VII.A3.AP-31	3.3.1- 072	C
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Heating Coil (purge supply unit) Tubes	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C

Table 3.3.2-28 Auxiliary Systems - Reactor Building Purge System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heating Coil (purge supply unit) Tubes	Structural Integrity	Copper Alloy	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	C
					Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	C
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A

Table 3.3.2-28 Auxiliary Systems - Reactor Building Purge System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,1

Table 3.3.2-28 Auxiliary Systems - Reactor Building Purge System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A

Table 3.3.2-28 Auxiliary Systems - Reactor Building Purge System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Air Handling Unit (230 KV relay house) Housing	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
Air Handling Unit (auxiliary building unit 3 battery room) Housing	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Air Handling Unit (auxiliary building ventilation supply units) Housing	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Air Handling Unit (auxiliary building ventilation supply units) Housing	Pressure Boundary	Galvanized Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Air Handling Unit (cable room units 1-34, 2-35, 3-11, 3-12) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Air Handling Unit (cable room units 1-52, 1-53, 2-52, 2-53) Housing	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Air Handling Unit (control room ventilation units - 11, -12, 3-13, 3-14) Housing	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
Air Handling Unit (equipment room) Housing	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Air Handling Unit (equipment room) Housing	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
Air Handling Unit (penetration room) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Air Handling Unit (standby shutdown facility building 0-42) Housing	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Air Handling Unit (standby shutdown facility building 0-42) Housing	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Cracking, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Cracking, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Loss of Preload	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.F1.A-794	3.3.1- 260	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Condenser Unit (230 KV relay house air handling units) Fins	Heat Transfer	Aluminum	Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A
				Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Condenser Unit (230 KV relay house air handling units) Tubes	Heat Transfer	Copper Alloy	Air – Outdoor (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Condenser Unit (230 KV relay house air handling units) Tubes	Heat Transfer	Copper Alloy	Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
	Pressure Boundary	Copper Alloy	Air – Outdoor (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
Condenser Unit (auxiliary building unit 3 battery room air handling unit) Fins	Heat Transfer	Aluminum	Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A
				Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Condenser Unit (auxiliary building unit 3 battery room air handling unit) Tubes	Heat Transfer	Copper Alloy	Air – Outdoor (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
	Pressure Boundary	Copper Alloy	Air – Outdoor (External)	None	None	VII.J.AP-144	3.3.1- 114	C

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Condenser Unit (auxiliary building unit 3 battery room air handling unit) Tubes	Pressure Boundary	Copper Alloy	Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
Cooling Coil (alternator air cooler) Head	Structural Integrity	Gray Cast Iron	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.A3.AP-189	3.3.1- 046	A
					Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	C
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
Cooling Coil (alternator air cooler) Tubes	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (automatic voltage regulating building air handling units) Head	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
		Gray Cast Iron	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.A3.AP-189	3.3.1- 046	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (automatic voltage regulating building air handling units) Head	Structural Integrity	Gray Cast Iron	Closed-Cycle Cooling Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	C
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
Cooling Coil (automatic voltage regulating building air handling units) Tubes	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (auxiliary building ventilation air handling unit 0-13, 0-27, -29, -30, -31, -32, -36, -44, -45, -46, -47, -49) Head	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (auxiliary building ventilation air handling unit 0-13, 0-27, -29, -30, -31, -32, -36, -44, -45, -46, -47, -49) Tubes	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (auxiliary building ventilation supply units) Fins	Heat Transfer	Aluminum	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A
				Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Cooling Coil (auxiliary building ventilation supply units) Head	Pressure Boundary	Gray Cast Iron	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (auxiliary building ventilation supply units) Head	Pressure Boundary	Gray Cast Iron	Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	C
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B
Cooling Coil (auxiliary building ventilation supply units) Tubes	Heat Transfer	Copper Alloy	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-187	3.3.1- 042	B
	Pressure Boundary	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B
Cooling Coil (cable room air handling units 1-34, 2-35, 3-11, 3-12) Fins	Heat Transfer	Aluminum	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (cable room air handling units 1-34, 2-35, 3-11, 3-12) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Cooling Coil (cable room air handling units 1-34, 2-35, 3-11, 3-12) Head	Pressure Boundary	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
		Gray Cast Iron	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.A3.AP-189	3.3.1- 046	A
					Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	C
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
Cooling Coil (cable room air handling units 1-34, 2-35, 3-11, 3-12) Tubes	Heat Transfer	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-205	3.3.1- 050	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (cable room air handling units 1-34, 2-35, 3-11, 3-12) Tubes	Heat Transfer	Copper Alloy	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A
	Pressure Boundary	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (cable room air handling units 1-52, 1-53, 2-52, 2-53) Fins	Heat Transfer	Aluminum	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A
				Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Cooling Coil (cable room air handling units 1-52, 1-53, 2-52, 2-53) Head	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Air – Indoor Uncontrolled (Internal)	None	None	VII.J.AP-144	3.3.1- 114	C
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (cable room air handling units 1-52, 1-53, 2-52, 2-53) Head	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Cooling Coil (cable room air handling units 1-52, 1-53, 2-52, 2-53) Tubes	Heat Transfer	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Air – Indoor Uncontrolled (Internal)	None	None	VII.J.AP-144	3.3.1- 114	C
	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Air – Indoor Uncontrolled (Internal)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (calibration room air handling unit 0-35) Head	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (calibration room air handling unit 0-35) Head	Structural Integrity	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
		Gray Cast Iron	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
Cooling Coil (calibration room air handling unit 0-35) Tubes	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (change room cooling units) Head	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (change room cooling units) Tubes	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (change room cooling units) Tubes	Structural Integrity	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (control room ventilation air handling units -11, -12, 3-13, 3-14) Head	Pressure Boundary	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	C
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
Cooling Coil (control room ventilation air handling units -11, -12, 3-13, 3-14) Tubes	Heat Transfer	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-205	3.3.1- 050	A
			Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A
	Pressure Boundary	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (control room ventilation air handling units -13, -14) Head	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
		Gray Cast Iron	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.A3.AP-189	3.3.1- 046	A
					Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	C
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
Cooling Coil (control room ventilation air handling units -13, -14) Tubes	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (emergency core cooling system pump room coolers air handling units - 3, -4, -5, -6, -7, -8; 3-1, 3-2, 3-3, 3-4) Head	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B,1
Cooling Coil (emergency core cooling system pump room coolers air handling units - 3, -4, -5, -6, -7, -8; 3-1, 3-2, 3-3, 3-4) Tubes	Structural Integrity	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B,1
Cooling Coil (equipment room air handling units) Fins	Heat Transfer	Aluminum	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (equipment room air handling units) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Cooling Coil (equipment room air handling units) Head	Pressure Boundary	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
		Gray Cast Iron	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.A3.AP-189	3.3.1- 046	A
					Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	C
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
Cooling Coil (equipment room air handling units) Tubes	Heat Transfer	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-205	3.3.1- 050	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (equipment room air handling units) Tubes	Heat Transfer	Copper Alloy	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A
	Pressure Boundary	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (isolated phase bus air cooler) Tubes	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (penetration room air handling units) Fins	Heat Transfer	Aluminum	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A
				Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (penetration room air handling units) Head	Pressure Boundary	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
		Gray Cast Iron	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.A3.AP-189	3.3.1- 046	A
					Selective Leaching (B2.1.21)	VII.C2.A-50	3.3.1- 072	C
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
Cooling Coil (penetration room air handling units) Tubes	Heat Transfer	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-205	3.3.1- 050	A
			Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (penetration room air handling units) Tubes	Pressure Boundary	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (power battery enclosure air handling unit 1-17) Tubes	Structural Integrity	Copper Alloy	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
Cooling Coil (power battery enclosure air handling unit 3-17) Tubes	Structural Integrity	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B,1
Cooling Coil (spent fuel pool supply unit air handling units) Head	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B,1

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cooling Coil (spent fuel pool supply unit air handling units) Head	Structural Integrity	Gray Cast Iron	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B,1
					Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	C
Cooling Coil (spent fuel pool supply unit air handling units) Tubes	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B,1
Damper Housing	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
					Fire Protection (B2.1.15)	VII.G.A-789	3.3.1- 255	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Damper Housing	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (Internal)	Loss of Material	Fire Protection (B2.1.15)	VII.G.A-789	3.3.1- 255	A
					Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
				Loss of Material, Cracking	Fire Protection (B2.1.15)	VII.G.A-789	3.3.1- 255	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
				Loss of Material, Cracking	Fire Protection (B2.1.15)	VII.G.A-789	3.3.1- 255	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Damper Housing	Pressure Boundary	Stainless Steel	Air – Outdoor (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
					Fire Protection (B2.1.15)	VII.G.A-789	3.3.1- 255	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Fire Protection (B2.1.15)	VII.G.A-789	3.3.1- 255	A
					Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Drain Pan	Structural Integrity	Galvanized Steel with Internal Coating/Lining	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Drain Pan	Structural Integrity	Galvanized Steel with Internal Coating/Lining	Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Coating or Lining Integrity	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-416	3.3.1- 138	E
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-414	3.3.1- 139	E
		Polymeric	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	A
			Waste Water (Internal)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-797b	3.3.1- 263	A,1
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Drain Pan	Structural Integrity	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,1
Ducting	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-781a	3.3.1- 094a	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.AP-99a	3.3.1- 094	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Evaporator Unit (230 KV relay house air handling units) Fins	Heat Transfer	Aluminum	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A
				Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Evaporator Unit (230 KV relay house air handling units) Tubes	Heat Transfer	Copper Alloy	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
	Pressure Boundary	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
Evaporator Unit (auxiliary building unit 3 battery room air handling unit) Fins	Heat Transfer	Aluminum	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.F1.A-788a	3.3.1- 254	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-771a	3.3.1- 242	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Evaporator Unit (auxiliary building unit 3 battery room air handling unit) Fins	Heat Transfer	Aluminum	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Evaporator Unit (auxiliary building unit 3 battery room air handling unit) Tubes	Heat Transfer	Copper Alloy	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
	Pressure Boundary	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
Evaporator Unit (protected service water building battery rooms) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Evaporator Unit (standby shutdown facility building air handling unit 0-42) Fins	Heat Transfer	Copper Alloy	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Evaporator Unit (standby shutdown facility building air handling unit 0-42) Head	Pressure Boundary	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
Evaporator Unit (standby shutdown facility building air handling unit 0-42) Tubes	Heat Transfer	Copper Alloy	Condensation (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
	Pressure Boundary	Copper Alloy	Condensation (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Gas (Internal)	None	None	VII.J.AP-9	3.3.1- 114	C
Fan (auxiliary building protected service water pump room exhaust) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Fan (auxiliary building protected service water pump room exhaust) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Fan (auxiliary building ventilation exhaust plenum) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Fan (auxiliary building ventilation exhaust) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Fan (control room outside air booster) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Fan (instrument air compressor room exhaust) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
Fan (protected service water building battery room exhaust) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Fan (protected service water building battery room exhaust) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
Fan (protected service water building battery room supply) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
Fan (protected service water building exhaust) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
Fan (standby shutdown facility building exhaust) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Fan (standby shutdown facility building exhaust) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
Fan (standby shutdown facility building supply) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
Fan (standby shutdown facility diesel engine exhaust) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-778	3.3.1- 249	C
Filter (control room ventilation) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter (control room ventilation) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Filter (protected service water building battery rooms) Housing	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
Filter (standby shutdown facility building inlet plenum) Housing	Pressure Boundary	Galvanized Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F1.A-08	3.3.1- 090	A
Flexible Connection	Pressure Boundary	Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Pressure Boundary	Elastomer	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A
			Air – Indoor Uncontrolled (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E1.A-504	3.3.1- 085	A
Heating Coil (auxiliary building ventilation supply units) Head	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Selective Leaching (B2.1.21)	VII.A3.AP-31	3.3.1- 072	C
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Heating Coil (auxiliary building ventilation supply units) Tubes	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	C

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heating Coil (auxiliary building ventilation supply units) Tubes	Structural Integrity	Copper Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	C
					Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	C
Heating Coil (spent fuel pool supply unit air handling units) Tubes	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	C
					Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	C
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-29 Auxiliary Systems - Ventilation Systems - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
	Structural Integrity	PVC	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-268	3.3.1- 119	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-787d	3.3.1- 253	A,1
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Filter Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,2
Flexible Connection	Pressure Boundary	Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A
			Lubricating Oil (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.A-677	3.3.1- 085	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
	Structural Integrity	Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A
			Lubricating Oil (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.A-677	3.3.1- 085	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
Heat Exchanger (emergency feedwater pump turbine oil cooler) Head	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B
Heat Exchanger (emergency feedwater pump turbine oil cooler) Shell	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-131	3.3.1- 098	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-131	3.3.1- 098	A
Heat Exchanger (emergency feedwater pump turbine oil cooler) Tubes	Heat Transfer	Copper Alloy (>15% Zn)	Lubricating Oil (External)	Reduction of Heat Transfer	Lubricating Oil Analysis (B2.1.25)	VII.H2.A-791	3.3.1- 257	A
					One-Time Inspection (B2.1.20)	VII.H2.A-791	3.3.1- 257	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (emergency feedwater pump turbine oil cooler) Tubes	Heat Transfer	Copper Alloy (>15% Zn)	Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	VII.H2.AP-187	3.3.1- 042	B
	Pressure Boundary	Copper Alloy (>15% Zn)	Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-133	3.3.1- 099	C
					One-Time Inspection (B2.1.20)	VII.H2.AP-133	3.3.1- 099	C
			Raw Water (Internal)	Cracking	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-473b	3.3.1- 160	B
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-66	3.3.1- 072	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B
Heat Exchanger (emergency feedwater pump turbine oil cooler) Tubesheet	Pressure Boundary	Copper Alloy (>15% Zn)	Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-133	3.3.1- 099	C
					One-Time Inspection (B2.1.20)	VII.H2.AP-133	3.3.1- 099	C
			Raw Water (Internal)	Cracking	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-473b	3.3.1- 160	B
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-66	3.3.1- 072	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (emergency feedwater pump turbine oil cooler) Tubesheet	Pressure Boundary	Copper Alloy (>15% Zn)	Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B
Heat Exchanger (feedwater pump turbine oil cooler) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.A3.AP-189	3.3.1- 046	A
Heat Exchanger (feedwater pump turbine oil cooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-131	3.3.1- 098	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-131	3.3.1- 098	A
Heat Exchanger (main turbine oil tank oil cooler) Head	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-416	3.3.1- 138	E,1
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B,2

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (main turbine oil tank oil cooler) Head	Structural Integrity	Gray Cast Iron	Raw Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-66	3.3.1- 072	A
Heat Exchanger (main turbine oil tank oil cooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-131	3.3.1- 098	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-131	3.3.1- 098	A
Heater Vessel (lube oil purifier heater)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-138	3.3.1- 100	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-133	3.3.1- 099	A
		Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-133	3.3.1- 099	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H1.AP-221a	3.3.1- 006	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-138	3.3.1- 100	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,2
Pump Casing (emergency feedwater pump turbine auxiliary oil)	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (emergency feedwater pump turbine oil transfer)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
Pump Casing (emergency feedwater pump turbine shaft driven main oil)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
Pump Casing (feedwater pump turbine main shaft oil)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (feedwater pump turbine oil transfer)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
Pump Casing (lube oil purifier auxiliary oil)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
Pump Casing (lube oil purifier)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (main turbine main shaft oil)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
Pump Casing (main turbine motor suction)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
Pump Casing (reclaim transfer)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-133	3.3.1- 099	A
		Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Lubricating Oil (Internal)	None	None	VII.J.AP-15	3.3.1- 117	A
			Waste Water (Internal)	None	None	VII.J.AP-277	3.3.1- 119	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-138	3.3.1- 100	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,2

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Stainless Steel	Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
Strainer Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
Tank (emergency feedwater pump turbine oil)	Pressure Boundary	Steel with Internal Coating/Lining	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (emergency feedwater pump turbine oil)	Pressure Boundary	Steel with Internal Coating/Lining	Lubricating Oil (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VII.G.A-416	3.3.1- 138	D
				Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	C,3
Tank (feedwater pump turbine oil)	Structural Integrity	Steel with Internal Coating/Lining	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Coating or Lining Integrity	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.A-416	3.3.1- 138	E
				Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	C
Tank (main turbine oil)	Structural Integrity	Steel with Internal Coating/Lining	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Coating or Lining Integrity	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.A-416	3.3.1- 138	E

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (main turbine oil)	Structural Integrity	Steel with Internal Coating/Lining	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	C
Tank (reclaim)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,2
Tank (transfer storage oil)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	C
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	C
Valve Body	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-133	3.3.1- 099	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Copper Alloy	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-133	3.3.1- 099	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-138	3.3.1- 100	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-133	3.3.1- 099	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	A,2
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-138	3.3.1- 100	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,2
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-30 Auxiliary Systems - Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.E1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.E1.AP-127	3.3.1- 097	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,2

Plant Specific Notes:

1. MTOT cooler heads have a localized coating type repair that will be managed with the Open Cycle Cooling Water program.
2. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
3. In accordance with industry best practice, the internal coating of this tank is not maintained. Therefore, loss of material of the tank base metal will be managed by the Lubricating Oil Analysis program

Table 3.3.2-31 Auxiliary Systems - Keowee Turbine Guide Bearing Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A

Table 3.3.2-31 Auxiliary Systems - Keowee Turbine Guide Bearing Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (keowee turbine guide bearing oil cooler) Head	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.H2.AP-55	3.3.1- 040	D
Heat Exchanger (keowee turbine guide bearing oil cooler) Shell	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	C
Heat Exchanger (keowee turbine guide bearing oil cooler) Tubes	Heat Transfer	Stainless Steel	Lubricating Oil (External)	Reduction of Heat Transfer	Lubricating Oil Analysis (B2.1.25)	VII.C1.A-791	3.3.1- 257	C
					One-Time Inspection (B2.1.20)	VII.C1.A-791	3.3.1- 257	C
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-187	3.3.1- 042	B

Table 3.3.2-31 Auxiliary Systems - Keowee Turbine Guide Bearing Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (keowee turbine guide bearing oil cooler) Tubes	Pressure Boundary	Stainless Steel	Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	C
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.H2.AP-55	3.3.1- 040	D
Heat Exchanger (keowee turbine guide bearing oil cooler) Tubesheet	Pressure Boundary	Stainless Steel	Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	C
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.H2.AP-55	3.3.1- 040	D
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A

Table 3.3.2-31 Auxiliary Systems - Keowee Turbine Guide Bearing Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Pump Casing (keowee turbine guide bearing oil (AC))	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Pump Casing (Keowee turbine guide bearing oil (DC))	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-31 Auxiliary Systems - Keowee Turbine Guide Bearing Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Pressure Boundary	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-133	3.3.1- 099	A
Strainer Screen	Filtration	Copper Alloy (>15% Zn)	Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-133	3.3.1- 099	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-133	3.3.1- 099	A
Tank (keowee lower oil reservoir)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	C

Table 3.3.2-31 Auxiliary Systems - Keowee Turbine Guide Bearing Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (keowee upper oil reservoir)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	C
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-31 Auxiliary Systems - Keowee Turbine Guide Bearing Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. None.

Table 3.3.2-32 Auxiliary Systems - Keowee Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Centrifuge Vessel	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A
		Steel	Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A

Table 3.3.2-32 Auxiliary Systems - Keowee Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Centrifuge Vessel	Structural Integrity	Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
Filter Body	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Heater Vessel (lube oil purifier electric heater)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-32 Auxiliary Systems - Keowee Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heater Vessel (lube oil purifier electric heater)	Structural Integrity	Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Piping	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
Pump Casing (lube oil recirculation)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-32 Auxiliary Systems - Keowee Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (lube oil reject)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Pump Casing (lube oil transfer)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Pump Casing (purified oil discharge)	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-133	3.3.1- 099	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-133	3.3.1- 099	C

Table 3.3.2-32 Auxiliary Systems - Keowee Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (unpurified oil feed)	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-133	3.3.1- 099	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-133	3.3.1- 099	C
Sight Glass	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-133	3.3.1- 099	A
		Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Lubricating Oil (Internal)	None	None	VII.J.AP-15	3.3.1- 117	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-32 Auxiliary Systems - Keowee Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Strainer Body	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Tank (gravity oil)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	C
Tank (lube oil)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	C

Table 3.3.2-32 Auxiliary Systems - Keowee Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-133	3.3.1- 099	A
			Waste Water (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-473c	3.3.1- 160	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	A, 1
					Selective Leaching (B2.1.21)	VII.E5.A-547	3.3.1- 072	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-32 Auxiliary Systems - Keowee Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-33 Auxiliary Systems - Filtered Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Piping	Structural Integrity	Aluminum	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A4.A-763a	3.3.1- 234	A,2
			Raw Water (Potable) (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C3.A-776b	3.3.1- 247	A,2
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-33 Auxiliary Systems - Filtered Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A,1
Pump Casing (filtered water booster)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A,1
Pump Casing (fuel cask decontamination booster)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A,1

Table 3.3.2-33 Auxiliary Systems - Filtered Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (fuel cask decontamination)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A,1
Strainer Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A,1
Tank (decontamination)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A

Table 3.3.2-33 Auxiliary Systems - Filtered Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (decontamination)	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A,1
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A,1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
2. FW piping is Aluminum 6061-T6, which is not susceptible to SCC

Table 3.3.2-34 Auxiliary Systems - Keowee Main Turbine System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Piping	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Air – Outdoor (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E1.A-722	3.3.1- 157	A
			Concrete (External)	None	None	VII.J.AP-282	3.3.1- 112	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B

Table 3.3.2-34 Auxiliary Systems - Keowee Main Turbine System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
Valve Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E1.A-722	3.3.1- 157	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B

Plant Specific Notes:

1. None.

Table 3.3.2-35 Auxiliary Systems - Leak Rate Test System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-35 Auxiliary Systems - Leak Rate Test System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A

Table 3.3.2-35 Auxiliary Systems - Leak Rate Test System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Galvanized Steel	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-24	3.3.1- 080	A
			Air – Outdoor (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E1.A-722	3.3.1- 157	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-35 Auxiliary Systems - Leak Rate Test System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-35 Auxiliary Systems - Leak Rate Test System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-35 Auxiliary Systems - Leak Rate Test System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Plant Specific Notes:

1. None.

Table 3.3.2-36 Auxiliary Systems - Plant Drinking Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Orifice	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A
			Raw Water >60°C (>140°F) (Potable) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	None	None	H

Table 3.3.2-36 Auxiliary Systems - Plant Drinking Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-271	3.3.1- 093	A
		Galvanized Steel	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Raw Water (Potable) (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A,1
		Polymeric	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	A
			Raw Water (Potable) (Internal)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-797b	3.3.1- 263	A,1

Table 3.3.2-36 Auxiliary Systems - Plant Drinking Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	PVC	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-268	3.3.1- 119	A
			Raw Water (Potable) (Internal)	None	None	VII.J.AP-269	3.3.1- 119	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A
			Raw Water >60°C (>140°F) (Potable) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	None	None	H
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Raw Water (Potable) (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A

Table 3.3.2-36 Auxiliary Systems - Plant Drinking Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A,1
Pump Casing (hot water circulation)	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-271	3.3.1- 093	A
Pump Casing (hot water recirculation)	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-271	3.3.1- 093	A
Tank (package steam fired water heater)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A

Table 3.3.2-36 Auxiliary Systems - Plant Drinking Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (package steam fired water heater)	Structural Integrity	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
		Steel with Internal Coating/Lining	Raw Water (Potable) (Internal)	Loss of Coating or Lining Integrity	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.A-416	3.3.1- 138	E
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.A-414	3.3.1- 139	E
Tank (standby shutdown facility water storage)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Potable) (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	C,1
Tank (water heater 119 gallon)	Structural Integrity	Glass	Raw Water (Internal)	None	None	VII.J.AP-50	3.3.1- 117	C

Table 3.3.2-36 Auxiliary Systems - Plant Drinking Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (water heater 119 gallon)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
Tank (water heater 30 gallon)	Structural Integrity	Glass	Raw Water (Internal)	None	None	VII.J.AP-50	3.3.1- 117	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
Valve Body	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-271	3.3.1- 093	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-36 Auxiliary Systems - Plant Drinking Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	A
			Raw Water >60°C (>140°F) (Potable) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	None	None	H

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-37 Auxiliary Systems - Radiation Monitoring System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Heat Exchanger (1,2RIA-35 and RIA-31) Head	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	D, 1
Heat Exchanger (1,2RIA-35 and RIA-31) Shell	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	D, 1
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-37 Auxiliary Systems - Radiation Monitoring System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B, 1
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Pump Casing (1RIA-35 Sample)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B, 1

Table 3.3.2-37 Auxiliary Systems - Radiation Monitoring System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (1RIA-35 Sample)	Structural Integrity	Gray Cast Iron	Raw Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-38 Auxiliary Systems - Stator Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Filter Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Flow Element	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-38 Auxiliary Systems - Stator Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Heat Exchanger (generator water) Head	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-80	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-80	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.F.SP-85	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.F.SP-85	3.4.1- 011	A
Heat Exchanger (generator water) Shell	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A

Table 3.3.2-38 Auxiliary Systems - Stator Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (generator water) Shell	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-80	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-80	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.F.SP-85	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.F.SP-85	3.4.1- 011	A
Piping	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-38 Auxiliary Systems - Stator Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Pump Casing (stator cooling)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Strainer Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A

Table 3.3.2-38 Auxiliary Systems - Stator Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Tank (ion exchange demineralizer)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-162	3.4.1- 083	A
					Water Chemistry (B2.1.2)	VIII.E.SP-162	3.4.1- 083	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-97	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-97	3.4.1- 011	A
Tank (stator coolant storage)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-162	3.4.1- 083	A

Table 3.3.2-38 Auxiliary Systems - Stator Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (stator coolant storage)	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-162	3.4.1- 083	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-97	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-97	3.4.1- 011	A
Valve Body	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.A.SP-101	3.4.1- 016	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.3.2-38 Auxiliary Systems - Stator Coolant System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Plant Specific Notes:

1. None.

Table 3.3.2-39 Auxiliary Systems - Station Sewage Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Piping	Structural Integrity	Galvanized Steel	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,1
		Polymeric	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	A
			Waste Water (Internal)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-797b	3.3.1- 263	A, 1

Table 3.3.2-39 Auxiliary Systems - Station Sewage Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	PVC	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-268	3.3.1- 119	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-787d	3.3.1- 253	A, 1
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Tank (sewage ejector surge)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A

Table 3.3.2-39 Auxiliary Systems - Station Sewage Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (sewage ejector surge)	Structural Integrity	Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,1
Tank (sewage ejector)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
					Selective Leaching (B2.1.21)	VII.E5.A-547	3.3.1- 072	C
Valve Body	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1

Table 3.3.2-39 Auxiliary Systems - Station Sewage Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Gray Cast Iron	Waste Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VII.E5.A-547	3.3.1- 072	A
		Polymeric	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	A
			Waste Water (Internal)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-797b	3.3.1- 263	A, 1
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A

Table 3.3.2-39 Auxiliary Systems - Station Sewage Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-40 Auxiliary Systems - Keowee Turbine Sump Pump System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Orifice	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-40 Auxiliary Systems - Keowee Turbine Sump Pump System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1
Piping	Pressure Boundary	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Air – Outdoor (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Concrete (External)	None	None	VII.J.A-711	3.3.1- 166	A
			Waste Water (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-473c	3.3.1- 160	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.E5.A-547	3.3.1- 072	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-40 Auxiliary Systems - Keowee Turbine Sump Pump System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Concrete (External)	None	None	VII.J.AP-19	3.3.1- 202	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1
Pump Casing (AC spare)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A

Table 3.3.2-40 Auxiliary Systems - Keowee Turbine Sump Pump System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (AC spare)	Structural Integrity	Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A, 1
Pump Casing (AC)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A
Pump Casing (DC)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A

Table 3.3.2-40 Auxiliary Systems - Keowee Turbine Sump Pump System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.E5.A-724	3.3.1- 072	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A
Strainer Screen	Filtration	Stainless Steel	Waste Water (External)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
Valve Body	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	A
		Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A

Table 3.3.2-40 Auxiliary Systems - Keowee Turbine Sump Pump System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Copper Alloy (>15% Zn)	Air – Outdoor (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Waste Water (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-473c	3.3.1- 160	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.E5.A-547	3.3.1- 072	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-40 Auxiliary Systems - Keowee Turbine Sump Pump System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A, 1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Air Dryer (vacuum)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Air Ejector (condensate steam)	Structural Integrity	Ductile Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VII.A3.AP-31	3.3.1- 072	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Air Ejector (condensate steam)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VII.A3.AP-31	3.3.1- 072	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Air Ejector (condensate steam)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Air Ejector (emergency steam)	Structural Integrity	Ductile Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VII.A3.AP-31	3.3.1- 072	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
		Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Air Ejector (emergency steam)	Structural Integrity	Gray Cast Iron	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VII.A3.AP-31	3.3.1- 072	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Air Ejector (emergency steam)	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Blower Casing (condensate steam air ejector)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Expansion Joint	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Filter Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Moisture Separator (condensate steam air ejector blower)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Moisture Separator (RIA-40)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VII.G.A-51	3.3.1- 072	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-26	3.3.1- 055	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
						VII.C1.AP-194	3.3.1- 037	B,1
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Piping and Piping Components	Structural Integrity	Steel	Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A,2

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (continuous priming vacuum)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-26	3.3.1- 055	A
Pump Casing (main vacuum)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-26	3.3.1- 055	A
Sight Glass	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.A.SP-101	3.4.1- 016	A
		Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Glass	Raw Water (Internal)	None	None	VII.J.AP-50	3.3.1- 117	A
			Treated Water (Internal)	None	None	VII.J.AP-51	3.3.1- 117	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
Silencer	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-26	3.3.1- 055	A
Tank (continuous priming vacuum)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (continuous priming vacuum)	Structural Integrity	Steel	Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	D,1
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.A.SP-101	3.4.1- 016	A
		Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Gray Cast Iron	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VII.G.A-51	3.3.1- 072	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-26	3.3.1- 055	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.G.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.3.2-41 Auxiliary Systems - Vacuum System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
2. The terminology "Piping and Piping Components" represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.3.2-42 Auxiliary Systems - Electro-Hydraulic Control System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Expansion Joint	Structural Integrity	Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A
			Lubricating Oil (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.A-677	3.3.1- 085	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A

Table 3.3.2-42 Auxiliary Systems - Electro-Hydraulic Control System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Structural Integrity	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A
Filter Body	Structural Integrity	Aluminum	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.G.A-451a	3.3.1- 189	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.A4.A-763a	3.3.1- 234	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.G.AP-162	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.G.AP-162	3.3.1- 099	A
Heat Exchanger (electro-hydraulic control cooler) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.A3.AP-189	3.3.1- 046	A
Heat Exchanger (electro-hydraulic control cooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-131	3.3.1- 098	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-131	3.3.1- 098	A
Piping	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-42 Auxiliary Systems - Electro-Hydraulic Control System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A
Pump Casing (electro-hydraulic control)	Structural Integrity	Ductile Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Pump Casing (transfer and filtering)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Lubricating Oil (Internal)	None	None	VII.J.AP-15	3.3.1- 117	A

Table 3.3.2-42 Auxiliary Systems - Electro-Hydraulic Control System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Tank (electro-hydraulic control reservoir)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	C
Tank (nitrogen accumulators)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	C
Tank (recirculating)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A

Table 3.3.2-42 Auxiliary Systems - Electro-Hydraulic Control System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (recirculating)	Structural Integrity	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	C
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A

Plant Specific Notes:

1. None.

Table 3.3.2-43 Auxiliary Systems - Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Flexible Connection	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Fuel Oil (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-136	3.3.1- 071	E,4
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-234	3.3.1- 070	E,4

Table 3.3.2-43 Auxiliary Systems - Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Polymeric	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-797a	3.3.1- 263	A
			Fuel Oil (Internal)	None	None	None	None	H,3
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Fuel Oil (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-136	3.3.1- 071	E,4
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-234	3.3.1- 070	E,4
			Lubricating Oil (Waste Oil) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-117	3.3.1- 250	E,1

Table 3.3.2-43 Auxiliary Systems - Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pulsation Dampener	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Waste Oil) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	None	None	G,1,2
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Waste Oil) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-117	3.3.1- 250	E,1
Pump Casing (auxiliary boiler fuel oil supply)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-234	3.3.1- 070	E,4

Table 3.3.2-43 Auxiliary Systems - Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (waste oil metering)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Waste Oil) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-117	3.3.1- 250	E,1
Sight Glass	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Waste Oil) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	None	None	G,1,2
Strainer Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-234	3.3.1- 070	E,4

Table 3.3.2-43 Auxiliary Systems - Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Structural Integrity	Steel	Lubricating Oil (Waste Oil) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-117	3.3.1- 250	E,1
Tank (WOCOS pump supply)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Waste Oil) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-117	3.3.1- 250	E,1
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Fuel Oil (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-136	3.3.1- 071	E,4
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-43 Auxiliary Systems - Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Fuel Oil (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-234	3.3.1- 070	E,4
			Lubricating Oil (Waste Oil) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-117	3.3.1- 250	E,1

Plant Specific Notes:

1. This portion of the system potentially contains waste oil, contaminated oil, and solvents; therefore, a periodic inspection program is used in lieu of a one time inspection for conservatism.
2. Lubricating Oil (Waste Oil) is not an environment identified by NUREG-2191 for a stainless steel sight glass or a stainless steel pulsation dampener.
3. Piping constructed of PDVF (Polymeric) is used with a fuel oil internal environment. Per EPRI Tools section C.2.1.6, polymerics have no aging effects in this environment. The polymeric/fuel oil environment does not exists in GALL.
4. The fuel oil supply to the auxiliary boiler is not routinely analyzed for water or corrosion product contamination, therefore this component is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program instead of the Fuel Oil Chemistry Program.

Table 3.3.2-44 Auxiliary Systems - Keowee Generator High Pressure Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Filter Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-44 Auxiliary Systems - Keowee Generator High Pressure Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-133	3.3.1- 099	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-133	3.3.1- 099	A
Pump Casing (ac generator high pressure oil)	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-44 Auxiliary Systems - Keowee Generator High Pressure Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (ac generator high pressure oil)	Pressure Boundary	Gray Cast Iron	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Pump Casing (dc generator high pressure oil)	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Tank (generator thrust & guide bearings)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	C
Valve Body	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-133	3.3.1- 099	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-44 Auxiliary Systems - Keowee Generator High Pressure Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A

Plant Specific Notes:

1. None.

Table 3.3.2-45 Auxiliary Systems - Keowee Governor Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Flexible Connection	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A

Table 3.3.2-45 Auxiliary Systems - Keowee Governor Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-45 Auxiliary Systems - Keowee Governor Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Pump Casing (governor oil A,B,C)	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Sight Glass	Pressure Boundary	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Lubricating Oil (Internal)	None	None	VII.J.AP-15	3.3.1- 117	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-45 Auxiliary Systems - Keowee Governor Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Pressure Boundary	Steel	Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Tank (governor oil pressure)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	C
Tank (governor oil sump)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	C
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A

Table 3.3.2-45 Auxiliary Systems - Keowee Governor Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A

Plant Specific Notes:

1. None.

Table 3.3.2-46 Auxiliary Systems - Refueling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Filter Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
Flexible Connection	Structural Integrity	Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A

Table 3.3.2-46 Auxiliary Systems - Refueling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Elastomer	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A
			Treated Water (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.G.AP-75	3.3.1- 085	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
Piping	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A

Table 3.3.2-46 Auxiliary Systems - Refueling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
Pump Casing (hydraulic power unit)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
Sight Glass	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	A
		Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A

Table 3.3.2-46 Auxiliary Systems - Refueling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Glass	Treated Water (Internal)	None	None	VII.J.AP-51	3.3.1- 117	A
Tank (hydraulic power unit)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-162	3.4.1- 083	A
					Water Chemistry (B2.1.2)	VIII.G.SP-162	3.4.1- 083	A
Valve Body	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	A
		Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.AP-66	3.3.1- 009	A

Table 3.3.2-46 Auxiliary Systems - Refueling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy (>15% Zn)	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	A
					Selective Leaching (B2.1.21)	VII.C2.AP-32	3.3.1- 072	A
					Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A

Plant Specific Notes:

1. None.

Table 3.3.2-47 Auxiliary Systems - Hydrogen Seal Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Filter Body	Structural Integrity	Ductile Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Piping	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A

Table 3.3.2-47 Auxiliary Systems - Hydrogen Seal Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Pump Casing (emergency seal oil)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Pump Casing (main seal oil)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-47 Auxiliary Systems - Hydrogen Seal Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (recirculating seal oil)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Pump Casing (seal oil vacuum)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Lubricating Oil (Internal)	None	None	VII.J.AP-15	3.3.1- 117	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-47 Auxiliary Systems - Hydrogen Seal Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A
Tank (seal oil separator)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	C
Tank (seal oil vacuum)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	C
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	C
Trap Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-47 Auxiliary Systems - Hydrogen Seal Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-133	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-133	3.3.1- 099	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-138	3.3.1- 100	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.C1.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.C1.AP-127	3.3.1- 097	A

Table 3.3.2-47 Auxiliary Systems - Hydrogen Seal Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. None.

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Air Ejector	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Underground (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-243	3.3.1- 108	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Raw Water (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-423	3.3.1- 142	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Underground (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-241	3.3.1- 109	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Underground (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-243	3.3.1- 108	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Underground (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-241	3.3.1- 109	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Expansion Joint	Pressure Boundary	Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Pressure Boundary	Elastomer	Air – Outdoor (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A
			Raw Water (Internal)	Hardening or Loss of Strength, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.AP-75	3.3.1- 085	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.AP-76	3.3.1- 096	A
	Structural Integrity	Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Structural Integrity	Elastomer	Raw Water (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.AP-75	3.3.1- 085	A,1
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.AP-76	3.3.1- 096	A,1
Flexible Connection	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Flow Restriction	Stainless Steel	Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
Heat Exchanger (standby shutdown facility heating, ventilation, and air conditioning condenser) Head	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	D

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (standby shutdown facility heating, ventilation, and air conditioning condenser) Shell	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Gas (Internal)	None	None	VII.J.AP-6	3.3.1- 121	A
Heat Exchanger (standby shutdown facility heating, ventilation, and air conditioning condenser) Tubes	Heat Transfer	Copper Alloy	Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-187	3.3.1- 042	B
	Pressure Boundary	Copper Alloy	Gas (External)	None	None	VII.J.AP-9	3.3.1- 114	C
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	D
Heat Exchanger (standby shutdown facility heating, ventilation, and air conditioning condenser) Tubesheet	Pressure Boundary	Steel	Gas (External)	None	None	VII.J.AP-6	3.3.1- 121	C
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (standby shutdown facility heating, ventilation, and air conditioning condenser) Tubesheet	Pressure Boundary	Steel	Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	D
Orifice	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-137	3.3.1- 107	B
			Underground (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-714a	3.3.1- 146	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-775a	3.3.1- 246	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Concrete (External)	None	None	VII.J.AP-282	3.3.1- 112	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-198	3.3.1- 109	B
			Underground (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-284	3.3.1- 109	B
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel with Internal Coating/Lining	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Concrete (External)	None	None	VII.J.AP-282	3.3.1- 112	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (External)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VII.C1.A-416	3.3.1- 138	B

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel with Internal Coating/Lining	Raw Water (Internal)	Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VII.C1.A-414	3.3.1- 139	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-198	3.3.1- 109	B
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
			Underground (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-714a	3.3.1- 146	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-775a	3.3.1- 246	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,1
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Concrete (External)	None	None	VII.J.AP-282	3.3.1- 112	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
						VII.C1.AP-194	3.3.1- 037	B,1

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Underground (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-284	3.3.1- 109	B
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,1
		Steel with Internal Coating/Lining	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VII.C1.A-416	3.3.1- 138	B

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel with Internal Coating/Lining	Raw Water (Internal)	Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VII.C1.A-414	3.3.1- 139	B
Piping and Piping Components	Structural Integrity	Steel	Raw Water (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A,3
Pump Casing (chiller service water)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
					Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
Pump Casing (condenser circulating water booster)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (condenser circulating water intake)	Pressure Boundary	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (External)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
Pump Casing (emergency feedwater pump turbine oil cooler)	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
Pump Casing (recirculating)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (recirculating)	Structural Integrity	Gray Cast Iron	Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
					Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
Pump Casing (standby shutdown facility auxiliary service water)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
Pump Casing (standby shutdown facility building sump)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,1

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (standby shutdown facility diesel engine service water)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
Pump Casing (standby shutdown facility heating, ventilation, and air conditioning service water)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
Pump Casing (submersible)	Pressure Boundary	Ductile Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A,2
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A,2

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (unwatering)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
					Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
Strainer Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Structural Integrity	Gray Cast Iron	Raw Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
Strainer Screen	Filtration	Stainless Steel	Raw Water (External)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Tank (ball collector)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	D,1
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Air – Outdoor (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
			Underground (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-714a	3.3.1- 146	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-775a	3.3.1- 246	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
			Underground (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-284	3.3.1- 109	B
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A
	Structural Integrity	Ductile Iron	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
					Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Gray Cast Iron	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
					Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
			Underground (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-284	3.3.1- 109	B
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,1

Table 3.3.2-48 Auxiliary Systems - Condenser Circulating Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
2. The submersible pump is normally stored in the standby shutdown facility. The pump is exposed to raw water only during brief periods of time when the pump is flow tested. The normal environment is air indoor uncontrolled.
3. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
Expansion Joint	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
Filter Body	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Body	Pressure Boundary	Gray Cast Iron	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
Filter Screen	Filtration	Stainless Steel	Raw Water (External)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A,1
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A,1
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A,1
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
Hose (stored equipment)	Pressure Boundary	Aluminum	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.A-451a	3.3.1- 189	A,3
				Loss of Material	One-Time Inspection (B2.1.20)	VII.A4.A-763a	3.3.1- 234	A,3
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C2.A-451a	3.3.1- 189	A,3
				Loss of Material	One-Time Inspection (B2.1.20)	VII.A4.A-763a	3.3.1- 234	A,3

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Hose (stored equipment)	Pressure Boundary	Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A,3
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A,3
			Air – Indoor Uncontrolled (Internal)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A,3
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A,3
Nozzle	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
Orifice	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Flow Restriction	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
		Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Concrete (External)	None	None	VII.J.AP-282	3.3.1- 112	A

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
						VII.C1.AP-194	3.3.1- 037	B,1
Piping (stored equipment)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A,3
			Air – Indoor Uncontrolled (Internal)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	C,3
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A,3

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping (stored equipment)	Pressure Boundary	Steel	Air – Outdoor (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F3.A-722	3.3.1- 157	A,3
Piping and Piping Components	Pressure Boundary	Stainless Steel	Raw Water (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,2
		Steel	Raw Water (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A,2
	Structural Integrity	Steel	Raw Water (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A,2
Pump Casing (chiller condenser service water)	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
Pump Casing (low pressure service water)	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (low pressure service water)	Pressure Boundary	Gray Cast Iron	Raw Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Raw Water (Internal)	None	None	VII.J.AP-50	3.3.1- 117	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
Strainer Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Pressure Boundary	Steel with Internal Coating/Lining	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VII.C1.A-416	3.3.1- 138	B
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VII.C1.A-414	3.3.1- 139	B
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Structural Integrity	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
Strainer Screen	Filtration	Stainless Steel	Raw Water (External)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Valve Body	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-196	3.3.1- 034	B
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Air (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
		Steel	Air – Dry (Internal)	Loss of Material	Compressed Air Monitoring (B2.1.14)	VII.D.A-764	3.3.1- 235	A
			Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-196	3.3.1- 034	B,1
		Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Cracking	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-473b	3.3.1- 160	B
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-196	3.3.1- 034	B,1
					Selective Leaching (B2.1.21)	VII.C1.A-47	3.3.1- 072	A
		Ductile Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Ductile Iron	Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
					Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Condensation (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A

Table 3.3.2-49 Auxiliary Systems - Low Pressure Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
2. The terminology "Piping and Piping Components" represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.
3. Stored equipment used for alternate Reactor Building Cooling is located in a hose trailer and in the yard. Those components stored within the hose trailer are evaluated with an air-indoor uncontrolled environment while those stored in the yard are evaluated with an air-outdoor environment.

Table 3.3.2-50 Auxiliary Systems - Protected Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Filter Body	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-50 Auxiliary Systems - Protected Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Body	Pressure Boundary	Gray Cast Iron	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
Filter Screen	Filtration	Stainless Steel	Raw Water (External)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-50 Auxiliary Systems - Protected Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Flow Restriction	Stainless Steel	Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Concrete (External)	None	None	VII.J.AP-19	3.3.1- 202	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-50 Auxiliary Systems - Protected Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Concrete (External)	None	None	VII.J.AP-282	3.3.1- 112	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B

Table 3.3.2-50 Auxiliary Systems - Protected Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B,1
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,1
Piping (stored equipment)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A,3
			Air – Indoor Uncontrolled (Internal)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	C,3
Pump Casing (portable)	Pressure Boundary	Ductile Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A,2
			Air – Indoor Uncontrolled (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A,2
Pump Casing (protected service water booster)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-50 Auxiliary Systems - Protected Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (protected service water booster)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Pump Casing (protected service water primary)	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B

Table 3.3.2-50 Auxiliary Systems - Protected Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,1

Table 3.3.2-50 Auxiliary Systems - Protected Service Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
2. The portable pump is normally stored in a warehouse. The pump is exposed to raw water only during brief periods of time when the pump is flow tested. The normal environment is air indoor uncontrolled.
3. Stored equipment in the PSW System, which is normally located in a warehouse, is evaluated with an air-indoor uncontrolled environment.

Table 3.3.2-51 Auxiliary Systems - Siphon Seal Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Underground (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-243	3.3.1- 108	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A

Table 3.3.2-51 Auxiliary Systems - Siphon Seal Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Underground (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-243	3.3.1- 108	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-51 Auxiliary Systems - Siphon Seal Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Flow Restriction	Stainless Steel	Air – Outdoor (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A

Table 3.3.2-51 Auxiliary Systems - Siphon Seal Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Condensation (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-137	3.3.1- 107	B
			Underground (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-714a	3.3.1- 146	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-775a	3.3.1- 246	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
			Underground (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-714a	3.3.1- 146	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-775a	3.3.1- 246	A
Strainer Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-51 Auxiliary Systems - Siphon Seal Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Pressure Boundary	Stainless Steel	Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Strainer Screen	Filtration	Stainless Steel	Raw Water (External)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
			Underground (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-714a	3.3.1- 146	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-775a	3.3.1- 246	A
	Structural Integrity	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A

Table 3.3.2-51 Auxiliary Systems - Siphon Seal Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Condensation (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-52 Auxiliary Systems - Keowee Turbine Generator Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-52 Auxiliary Systems - Keowee Turbine Generator Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Heat Exchanger (generator air cooler) Fins	Heat Transfer	Copper Alloy	Air – Indoor Uncontrolled (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	C
Heat Exchanger (generator air cooler) Tubes	Heat Transfer	Copper Alloy	Air – Indoor Uncontrolled (External)	Reduction of Heat Transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.C1.A-419	3.3.1- 096a	A
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-187	3.3.1- 042	B
	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B
Heat Exchanger (generator air cooler) Tubesheet	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	D

Table 3.3.2-52 Auxiliary Systems - Keowee Turbine Generator Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (generator air cooler) Waterbox	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	D
Piping	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-196	3.3.1- 034	B
		Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Cracking	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-473b	3.3.1- 160	B
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-47	3.3.1- 072	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-196	3.3.1- 034	B
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A

Table 3.3.2-52 Auxiliary Systems - Keowee Turbine Generator Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Concrete (External)	None	None	VII.J.AP-282	3.3.1- 112	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Cracking	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-473b	3.3.1- 160	B
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-196	3.3.1- 034	B, 1
					Selective Leaching (B2.1.21)	VII.C1.A-47	3.3.1- 072	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-52 Auxiliary Systems - Keowee Turbine Generator Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-400a	3.3.1- 127	B
						VII.C1.AP-194	3.3.1- 037	B,1
Strainer Body	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-51	3.3.1- 072	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-52 Auxiliary Systems - Keowee Turbine Generator Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Strainer Screen	Filtration	Stainless Steel	Raw Water (External)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
Valve Body	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-196	3.3.1- 034	B
		Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Cracking	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-473b	3.3.1- 160	B
				Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-47	3.3.1- 072	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-196	3.3.1- 034	B
		Copper Alloy (>8% Al)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Raw Water (Internal)	Cracking	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-473b	3.3.1- 160	B

Table 3.3.2-52 Auxiliary Systems - Keowee Turbine Generator Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Copper Alloy (>8% Al)	Raw Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VII.C1.A-47	3.3.1- 072	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-196	3.3.1- 034	B
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-194	3.3.1- 037	B
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-54	3.3.1- 040	B,1

Table 3.3.2-52 Auxiliary Systems - Keowee Turbine Generator Cooling Water System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.

Table 3.3.2-53 Auxiliary Systems - Standby Shutdown Facility Air Intake and Exhaust System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Expansion Joint	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-761b	3.3.1- 232	A
			Diesel Exhaust (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.AP-128	3.3.1- 083	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.AP-104	3.3.1- 088	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A

Table 3.3.2-53 Auxiliary Systems - Standby Shutdown Facility Air Intake and Exhaust System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Pressure Boundary	Steel	Diesel Exhaust (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.AP-104	3.3.1- 088	A
Flexible Connection	Pressure Boundary	Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A
			Air – Outdoor (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F4.A-504	3.3.1- 085	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F4.AP-103	3.3.1- 096	A
Insulation	Thermal Resistance	Calcium Silicate	Air – Indoor Uncontrolled (External)	Reduced Thermal Insulation Resistance	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-704	3.3.1- 182	A

Table 3.3.2-53 Auxiliary Systems - Standby Shutdown Facility Air Intake and Exhaust System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Muffler (exhaust silencer)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Diesel Exhaust (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.AP-104	3.3.1- 088	A
Muffler (intake filter / silencer)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Air – Outdoor (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.A-722	3.3.1- 157	A
Piping (exhaust)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-53 Auxiliary Systems - Standby Shutdown Facility Air Intake and Exhaust System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping (exhaust)	Pressure Boundary	Steel	Diesel Exhaust (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.AP-104	3.3.1- 088	A
Piping (intake)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air – Outdoor (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.A-722	3.3.1- 157	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Diesel Exhaust (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1
		Steel	Diesel Exhaust (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A,1
Screen (exhaust)	Filtration	Steel	Diesel Exhaust (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.AP-104	3.3.1- 088	A

Table 3.3.2-53 Auxiliary Systems - Standby Shutdown Facility Air Intake and Exhaust System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Screen (intake)	Filtration	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Plant Specific Notes:

1. The terminology "Piping and Piping Components" represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.3.2-54 Auxiliary Systems - Standby Shutdown Facility Diesel Jacket Water Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Flexible Connection	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Heat Exchanger (jacket water) Head	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B
Heat Exchanger (jacket water) Shell	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A

Table 3.3.2-54 Auxiliary Systems - Standby Shutdown Facility Diesel Jacket Water Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (jacket water) Shell	Pressure Boundary	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
Heat Exchanger (jacket water) Tubes	Heat Transfer	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (External)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-205	3.3.1- 050	A, 1
			Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	VII.H2.AP-187	3.3.1- 042	B, 1
	Pressure Boundary	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (External)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.A-473a	3.3.1- 160	A, 1
				Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A, 1
			Raw Water (Internal)	Cracking	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.A-473b	3.3.1- 160	B, 1
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-179	3.3.1- 038	B, 1
Heat Exchanger (jacket water) Tubesheet	Pressure Boundary	Steel	Closed-Cycle Cooling Water (External)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.A-532	3.3.1- 193	A
				Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B
Heater Casing (immersion heater)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-54 Auxiliary Systems - Standby Shutdown Facility Diesel Jacket Water Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heater Casing (immersion heater)	Pressure Boundary	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.A-52	3.3.1- 049	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.AP-186	3.3.1- 043	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Pump Casing (engine driven)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Sight Glass	Pressure Boundary	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Closed-Cycle Cooling Water (Internal)	None	None	VII.J.AP-166	3.3.1- 117	A

Table 3.3.2-54 Auxiliary Systems - Standby Shutdown Facility Diesel Jacket Water Cooling System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Tank (expansion)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A
Valve Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-202	3.3.1- 045	A

Plant Specific Notes:

1. Material of construction is inhibited Brass which is not susceptible to selective leaching.

Table 3.3.2-55 Auxiliary Systems - Standby Shutdown Facility Diesel Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Filter Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A
Flexible Connection	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A

Table 3.3.2-55 Auxiliary Systems - Standby Shutdown Facility Diesel Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (lube oil) Head	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
Heat Exchanger (lube oil) Shell	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-131	3.3.1- 098	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-131	3.3.1- 098	A
Heat Exchanger (lube oil) Tubes	Heat Transfer	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (Internal)	Reduction of Heat Transfer	Closed Treated Water System (B2.1.12)	VII.C2.AP-205	3.3.1- 050	A, 1
			Lubricating Oil (External)	Reduction of Heat Transfer	Lubricating Oil Analysis (B2.1.25)	VII.H2.A-791	3.3.1- 257	A
					One-Time Inspection (B2.1.20)	VII.H2.A-791	3.3.1- 257	A
	Pressure Boundary	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.A-473a	3.3.1- 160	A, 1
				Loss of Material	Closed Treated Water System (B2.1.12)	VII.E1.AP-203	3.3.1- 046	A, 1
			Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-133	3.3.1- 099	A

Table 3.3.2-55 Auxiliary Systems - Standby Shutdown Facility Diesel Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (lube oil) Tubes	Pressure Boundary	Copper Alloy (>15% Zn)	Lubricating Oil (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-133	3.3.1- 099	A
Heat Exchanger (lube oil) Tubesheet	Pressure Boundary	Steel	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
			Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-131	3.3.1- 098	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-131	3.3.1- 098	A
Orifice	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-138	3.3.1- 100	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-138	3.3.1- 100	A

Table 3.3.2-55 Auxiliary Systems - Standby Shutdown Facility Diesel Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-138	3.3.1- 100	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-138	3.3.1- 100	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-138	3.3.1- 100	A

Table 3.3.2-55 Auxiliary Systems - Standby Shutdown Facility Diesel Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A
Piping and Piping Components	Pressure Boundary	Steel	Lubricating Oil (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A,2
	Structural Integrity	Steel	Lubricating Oil (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A,2
Pump Casing (circulating)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A
Pump Casing (DC backup)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A

Table 3.3.2-55 Auxiliary Systems - Standby Shutdown Facility Diesel Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (DC backup)	Pressure Boundary	Steel	Lubricating Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A
Pump Casing (main bearing)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A
Pump Casing (piston cooling)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A
Pump Casing (scavenging)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A

Table 3.3.2-55 Auxiliary Systems - Standby Shutdown Facility Diesel Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Pressure Boundary	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Lubricating Oil (Internal)	None	None	VII.J.AP-15	3.3.1- 117	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A
Strainer Body	Pressure Boundary	Aluminum	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.A-451a	3.3.1- 189	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.A-763a	3.3.1- 234	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-162	3.3.1- 099	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-162	3.3.1- 099	A
Strainer Screen	Filtration	Steel	Lubricating Oil (External)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A

Table 3.3.2-55 Auxiliary Systems - Standby Shutdown Facility Diesel Lube Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (diesel engine oil sump)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	C
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	C
Valve Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VII.H2.AP-127	3.3.1- 097	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-127	3.3.1- 097	A

Plant Specific Notes:

1. Material of construction is inhibited Brass which is not susceptible to selective leaching.
2. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.3.2-56 Auxiliary Systems - Standby Shutdown Facility Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Soil (External)	Cracking	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.A-425	3.3.1- 144	D
				Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-243	3.3.1- 108	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Underground (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-243	3.3.1- 108	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-241	3.3.1- 109	B
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A

Table 3.3.2-56 Auxiliary Systems - Standby Shutdown Facility Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Filter Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H2.AP-136	3.3.1- 071	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-136	3.3.1- 071	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H1.AP-105a	3.3.1- 070	A, 1
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A

Table 3.3.2-56 Auxiliary Systems - Standby Shutdown Facility Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Body	Structural Integrity	Stainless Steel	Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H2.AP-136	3.3.1- 071	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-136	3.3.1- 071	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H1.AP-105a	3.3.1- 070	A, 1
Flexible Connection	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H2.AP-136	3.3.1- 071	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-136	3.3.1- 071	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H1.AP-105a	3.3.1- 070	A, 1
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A

Table 3.3.2-56 Auxiliary Systems - Standby Shutdown Facility Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H2.AP-136	3.3.1- 071	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-136	3.3.1- 071	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H2.AP-136	3.3.1- 071	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-136	3.3.1- 071	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Air – Outdoor (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A

Table 3.3.2-56 Auxiliary Systems - Standby Shutdown Facility Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Outdoor (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Concrete (External)	None	None	VII.J.AP-19	3.3.1- 202	A, 2
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H2.AP-136	3.3.1- 071	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-136	3.3.1- 071	A
			Soil (External)	Cracking	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.A-425	3.3.1- 144	B
				Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-137	3.3.1- 107	B
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H1.AP-105a	3.3.1- 070	A, 1
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H2.AP-136	3.3.1- 071	A

Table 3.3.2-56 Auxiliary Systems - Standby Shutdown Facility Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Fuel Oil (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-136	3.3.1- 071	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H1.AP-105a	3.3.1- 070	A, 1
Pump Casing (DC driven)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H1.AP-105a	3.3.1- 070	A, 1
Pump Casing (engine driven)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H1.AP-105a	3.3.1- 070	A, 1
Pump Casing (fuel oil recirculation)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H1.AP-105a	3.3.1- 070	A, 1

Table 3.3.2-56 Auxiliary Systems - Standby Shutdown Facility Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (fuel oil transfer)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H1.AP-105a	3.3.1- 070	A, 1
Strainer Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H2.AP-136	3.3.1- 071	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-136	3.3.1- 071	A
Strainer Screen	Filtration	Stainless Steel	Fuel Oil (External)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H2.AP-136	3.3.1- 071	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-136	3.3.1- 071	A
Tank (diesel engine fuel oil storage)	Pressure Boundary	Steel	Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H1.AP-105a	3.3.1- 070	A
			Soil (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-198	3.3.1- 109	B
			Underground (External)	Loss of Material	Buried and Underground Piping and Tanks (B2.1.26)	VII.I.AP-284	3.3.1- 109	D

Table 3.3.2-56 Auxiliary Systems - Standby Shutdown Facility Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (fuel oil day)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H1.AP-105a	3.3.1- 070	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Air – Outdoor (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H2.AP-136	3.3.1- 071	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-136	3.3.1- 071	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Fuel Oil (Internal)	Loss of Material	Fuel Oil Chemistry (B2.1.18)	VII.H2.AP-136	3.3.1- 071	A
					One-Time Inspection (B2.1.20)	VII.H2.AP-136	3.3.1- 071	A

Table 3.3.2-56 Auxiliary Systems - Standby Shutdown Facility Fuel Oil System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Component is constructed of the same material as the fuel oil storage tank. The fuel oil storage tank is not coated on its internal surface. One-time inspection of this component is not required per GALL AMP XI.M30, Element 4.
2. Stainless steel piping embedded in concrete exits the building above grade level. Concrete is not subject to soil or groundwater.

Table 3.3.2-57 Auxiliary Systems - Standby Shutdown Facility Starting Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
Compressor (starting air)	Structural Integrity	Ductile Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A, 2
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A, 2

Table 3.3.2-57 Auxiliary Systems - Standby Shutdown Facility Starting Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Flexible Connection	Pressure Boundary	Elastomer	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-102	3.3.1- 076	A
				Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-113	3.3.1- 082	A
			Condensation (Internal)	Hardening or Loss of Strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F4.A-504	3.3.1- 085	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.F4.AP-103	3.3.1- 096	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A

Table 3.3.2-57 Auxiliary Systems - Standby Shutdown Facility Starting Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
Heat Exchanger (aftercooler) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.AP-41	3.3.1- 080	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	C
Heat Exchanger (aftercooler) Tubes	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	C
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	C
Lubricator Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A

Table 3.3.2-57 Auxiliary Systems - Standby Shutdown Facility Starting Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-57 Auxiliary Systems - Standby Shutdown Facility Starting Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Strainer Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Strainer Screen	Filtration	Stainless Steel	Condensation (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
Tank (air dryer)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A

Table 3.3.2-57 Auxiliary Systems - Standby Shutdown Facility Starting Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (air receiver)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Tank (moisture separator)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.H2.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.H2.AP-221a	3.3.1- 006	A
			Condensation (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.D.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.D.AP-221a	3.3.1- 006	A

Table 3.3.2-57 Auxiliary Systems - Standby Shutdown Facility Starting Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
		Zinc	Air – Indoor Uncontrolled (External)	None	None	VII.J.A-712	3.3.1- 167	A
			Condensation (Internal)	None	None	VII.J.A-712	3.3.1- 167	A
	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A
			Condensation (Internal)	None	None	VII.J.AP-144	3.3.1- 114	A, 1
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Condensation (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A

Table 3.3.2-57 Auxiliary Systems - Standby Shutdown Facility Starting Air System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Zinc	Air – Indoor Uncontrolled (External)	None	None	VII.J.A-712	3.3.1- 167	A
			Condensation (Internal)	None	None	VII.J.A-712	3.3.1- 167	A

Plant Specific Notes:

1. Cracking of copper alloy (>15% Zn) in indoor air could result from ammonia-based compounds conveyed to external surfaces from bolted joint leakage through insulation. However, cracking of internal surfaces is not expected as these surfaces are not exposed to contamination from external leakage sources.
2. The compresor skid functions as an equivalent anchor for non-safety attached to safety piping.

Table 3.3.2-58 Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-58 Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Fan (gaseous waste disposal exhauster) Housing	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	C,3
Filter Housing	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	C,3

Table 3.3.2-58 Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,3
Heat Exchanger (gaseous waste disposal compressor seal water cooler) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VII.C2.AP-189	3.3.1- 046	A
Heat Exchanger (gaseous waste disposal compressor seal water cooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-58 Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (gaseous waste disposal compressor seal water cooler) Shell	Structural Integrity	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Orifice	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.3.2-58 Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air – Indoor Uncontrolled (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A,2
						VII.I.A-77	3.3.1- 078	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.D.A-26	3.3.1- 055	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A

Table 3.3.2-58 Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,3
Piping and Piping Components	Pressure Boundary	Stainless Steel	Gas (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,4
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A
			Treated Water (Internal)	None	None	VII.J.AP-51	3.3.1- 117	A
			Waste Water (Internal)	None	None	VII.J.AP-277	3.3.1- 119	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-58 Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,3
Strainer Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.3.2-58 Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (gaseous waste disposal decay)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,3
Tank (gaseous waste disposal separator)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A

Table 3.3.2-58 Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Trap Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,3
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air (Internal)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Gas (Internal)	None	None	VII.J.AP-22	3.3.1- 120	A
	Structural Integrity	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A,1

Table 3.3.2-58 Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Nickel Alloy	Air with Borated Water Leakage (External)	None	None	VII.J.AP-260	3.3.1- 119	A,1
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A,1
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A,1
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.G.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.G.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-405a	3.3.1- 132	A,2
						VII.I.A-77	3.3.1- 078	A

Table 3.3.2-58 Auxiliary Systems - Gaseous Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.A3.A-439	3.3.1- 193	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,3

Plant Specific Notes:

1. Subject component is nickel plated brass valve body.
2. Subject table row represents insulated components in the system.
3. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
4. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VII.I.A-426	3.3.1- 145	A
				Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VII.I.A-03	3.3.1- 012	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VII.I.AP-124	3.3.1- 015	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A,2
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A,2
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Filter Screen	Filtration	Stainless Steel	Waste Water (External)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,1

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Filter Screen	Filtration	Stainless Steel	Waste Water >60°C (>140°F) (External)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A,1
Flexible Connection	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Flow Element	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A,2
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A,2

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Orifice	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A,2
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A,2
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Concrete (External)	None	None	VII.J.AP-19	3.3.1- 202	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-144	3.3.1- 114	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-11	3.3.1- 115	A

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Copper Alloy	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	A,3
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A,2
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A,2
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,3
Piping and Piping Components	Pressure Boundary	Stainless Steel	Waste Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,4
	Structural Integrity	Stainless Steel	Waste Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,4
		Steel	Waste Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-34	3.3.1- 002	A,4
Pump Casing (condensate test tank waste discharge)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (condensate test tank waste discharge)	Structural Integrity	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Pump Casing (laundry and hot shower)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (miscellaneous waste transfer)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Pump Casing (reactor building normal sump)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (reactor building normal sump)	Structural Integrity	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Pump Casing (respirator washer drain transfer)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Pump Casing (spent resin sluicing)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (spent resin sluicing)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Pump Casing (spent resin transfer)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (spent resin transfer)	Structural Integrity	Stainless Steel	Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Pump Casing (turbine building sump monitor tank drain)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,3
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-48	3.3.1- 117	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-96	3.3.1- 117	A
			Waste Water (Internal)	None	None	VII.J.AP-277	3.3.1- 119	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Strainer Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Tank (laundry and hot shower)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (laundry and hot shower)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Tank (miscellaneous waste holdup)	Structural Integrity	Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (miscellaneous waste holdup)	Structural Integrity	Steel (with Stainless Steel Cladding)	Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Tank (respirator washer drain)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Tank (spent resin storage)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (spent resin storage)	Structural Integrity	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Tank (Unit 3 high activity spent resin storage)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.I.A-751b	3.3.1- 222	A
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	C
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.I.A-734b	3.3.1- 205	A,2
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A,2
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A
			Waste Water (Internal)	Loss of Material, Flow Blockage	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VII.C1.AP-209a	3.3.1- 004	A
						VII.I.A-734b	3.3.1- 205	A,2
				Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.AP-221a	3.3.1- 006	A
						VII.I.A-761b	3.3.1- 232	A,2
			Air with Borated Water Leakage (External)	None	None	VII.J.AP-18	3.3.1- 120	A

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-278	3.3.1- 095	A,3
			Waste Water >60°C (>140°F) (Internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.A-721	3.3.1- 155	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VII.I.A-77	3.3.1- 078	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VII.I.A-79	3.3.1- 009	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,3

Table 3.3.2-59 Auxiliary Systems - Liquid Waste Disposal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Subject components are for 1,2,3LWD-FL-0017 which are located in the RB Emergency Sump.
2. Subject table row represents insulated components in the system.
3. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
4. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Tables 3.3.2-1 through 3.3.2-59 Industry Standard Notes:

A. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

B. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-2191 AMP.

C. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

D. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP takes some exceptions to the NUREG-2191 AMP.

E. Consistent with NUREG-2191 item for material, environment, and aging effect, but a different AMP is credited or NUREG-2191 identifies a plant-specific AMP.

F. Material not in NUREG-2191 for this component.

G. Environment not in NUREG-2191 for this component and material.

H. Aging effect not in NUREG-2191 for this component, material, and environment combination.

I. Aging effect in NUREG-2191 for this component, material, and environment combination is not applicable.

J. Neither the component nor the material and environment combination are evaluated in NUREG-2191.

3.4 AGING MANAGEMENT OF STEAM AND POWER CONVERSION SYSTEMS

3.4.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.4, Steam and Power Conversion, as being subject to aging management review. The system or portions of systems which are addressed in this section are described in the indicated sections.

- Condensate System
- Feedwater System
- High Pressure Extraction System
- Heater Vent System
- Low Pressure Extraction System
- Heater Drain System
- Auxiliary Steam System
- Main Steam System
- Turbine and Auxiliaries
- Plant Heating System
- Steam Drain System
- Steam Seal System

3.4.2 RESULTS

The following tables summarize the results of the aging management review for Steam and Power Conversion Systems:

- Table 3.4.2-1, Steam and Power Conversion - Condensate System - Aging Management Evaluation
- Table 3.4.2-2, Steam and Power Conversion - Feedwater System - Aging Management Evaluation
- Table 3.4.2-3, Steam and Power Conversion - Heater Drain System - Aging Management Evaluation
- Table 3.4.2-4, Steam and Power Conversion - High Pressure Turbine Exhaust System - Aging Management Evaluation
- Table 3.4.2-5, Steam and Power Conversion - Heater Vent System - Aging Management Evaluation
- Table 3.4.2-6, Steam and Power Conversion - Low Pressure Turbine Exhaust System - Aging Management Evaluation
- Table 3.4.2-7, Steam and Power Conversion - Auxiliary Steam System - Aging Management Evaluation
- Table 3.4.2-8, Steam and Power Conversion - Main Steam System - Aging Management Evaluation
- Table 3.4.2-9, Steam and Power Conversion - Turbine and Auxiliaries System - Aging Management Evaluation

- Table 3.4.2-10, Steam and Power Conversion - Plant Heating System - Aging Management Evaluation
- Table 3.4.2-11, Steam and Power Conversion - Steam Drain System - Aging Management Evaluation
- Table 3.4.2-12, Steam and Power Conversion - Steam Seal System - Aging Management Evaluation

3.4.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.4.2.1.1 Condensate System

Materials

Components in the Condensate System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Ductile Iron
* Glass
* Gray Cast Iron
* Stainless Steel
* Steel
* Steel w. Nickel Plating
* Steel with Internal Coating/Lining

Environments

Components in the Condensate System are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air – Outdoor
* Closed-Cycle Cooling Water
* Concrete
* Lubricating Oil
* Raw Water
* Raw Water (Potable)
* Treated Water
* Treated Water >60°C (>140°F)
* Waste Water

Aging Effects Requiring Management

Components in the Condensate System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Flow Blockage
* Long-Term Loss of Material
* Loss of Coating or Lining Integrity
* Loss of Material
* Loss of Preload
* Reduction of Heat Transfer
* Wall Thinning

Aging Management Programs

The aging effects for components in the Condensate System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)
* Lubricating Oil Analysis (B2.1.25)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)
* TLAA
* Water Chemistry (B2.1.2)

3.4.2.1.2 Feedwater System

Materials

Components in the Feedwater System are constructed of the following materials:

* Copper Alloy (>15% Zn)
* Galvanized Steel
* Glass
* Polymeric
* Stainless Steel
* Steel
* Steel (with Stainless Steel Cladding)

Environments

Components in the Feedwater System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Closed-Cycle Cooling Water
* Closed-Cycle Cooling Water >60°C (>140°F)
* Raw Water (Potable)
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Feedwater System require aging management to address the following aging effects:

* Cracking
* Cracking or Blistering
* Cumulative Fatigue Damage

* Hardening or Loss of Strength
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Wall Thinning

Aging Management Programs

The aging effects for components in the Feedwater System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)
* TLAA
* Water Chemistry (B2.1.2)

3.4.2.1.3 Heater Drain System

Materials

Components in the Heater Drain System are constructed of the following materials:

* Copper Alloy
* Copper Alloy (>15% Zn)
* Glass
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Heater Drain System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Closed-Cycle Cooling Water
* Closed-Cycle Cooling Water >60°C (>140°F)
* Lubricating Oil
* Raw Water
* Raw Water (Potable)
* Treated Water
* Treated Water >60°C (>140°F)
* Waste Water

Aging Effects Requiring Management

Components in the Heater Drain System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage

* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Wall Thinning

Aging Management Programs

The aging effects for components in the Heater Drain System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Closed Treated Water System (B2.1.12)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* Lubricating Oil Analysis (B2.1.25)
* One-Time Inspection (B2.1.20)
* Open-Cycle Cooling Water System (B2.1.11)
* Selective Leaching (B2.1.21)
* TLAA
* Water Chemistry (B2.1.2)

3.4.2.1.4 High Pressure Turbine Exhaust System

Materials

Components in the High Pressure Turbine Exhaust System are constructed of the following materials:

* Stainless Steel
* Steel

Environments

Components in the High Pressure Turbine Exhaust System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the High Pressure Turbine Exhaust System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Wall Thinning

Aging Management Programs

The aging effects for components in the High Pressure Turbine Exhaust System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* One-Time Inspection (B2.1.20)
* TLAA
* Water Chemistry (B2.1.2)

3.4.2.1.5 Heater Vent System

Materials

Components in the Heater Vent System are constructed of the following materials:

* Stainless Steel
* Steel

Environments

Components in the Heater Vent System are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air – Outdoor
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Heater Vent System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Wall Thinning

Aging Management Programs

The aging effects for components in the Heater Vent System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* TLAA
* Water Chemistry (B2.1.2)

3.4.2.1.6 Low Pressure Turbine Extraction System

Materials

Components in the Low Pressure Turbine Extraction System are constructed of the following materials:

* Nickel Alloy
* Stainless Steel
* Steel

Environments

Components in the Low Pressure Turbine Extraction System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Low Pressure Turbine Extraction System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Wall Thinning

Aging Management Programs

The aging effects for components in the Low Pressure Turbine Extraction System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* One-Time Inspection (B2.1.20)
* TLAA
* Water Chemistry (B2.1.2)

3.4.2.1.7 Auxiliary Steam System

Materials

Components in the Auxiliary Steam System are constructed of the following materials:

* Copper Alloy
* Glass
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Auxiliary Steam System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Diesel Exhaust
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Auxiliary Steam System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Wall Thinning

Aging Management Programs

The aging effects for components in the Auxiliary Steam System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)
* TLAA
* Water Chemistry (B2.1.2)

3.4.2.1.8 Main Steam System

Materials

Components in the Main Steam System are constructed of the following materials:

* Copper Alloy
* High-Strength Steel
* Stainless Steel
* Steel

Environments

Components in the Main Steam System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Air with Borated Water Leakage
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Main Steam System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Wall Thinning

Aging Management Programs

The aging effects for components in the Main Steam System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* One-Time Inspection (B2.1.20)
* TLAA
* Water Chemistry (B2.1.2)

3.4.2.1.9 Turbine and Auxiliaries System

Materials

Components in the Turbine and Auxiliaries System are constructed of the following materials:

* High-Strength Steel
* Steel

Environments

Components in the Turbine and Auxiliaries System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Treated Water

Aging Effects Requiring Management

Components in the Turbine and Auxiliaries System require aging management to address the following aging effects:

* Cracking
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Turbine and Auxiliaries System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* One-Time Inspection (B2.1.20)
* Water Chemistry (B2.1.2)

3.4.2.1.10 Plant Heating System

Materials

Components in the Plant Heating System are constructed of the following materials:

* Copper Alloy
* Gray Cast Iron
* Stainless Steel
* Steel

Environments

Components in the Plant Heating System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air with Borated Water Leakage
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Plant Heating System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Wall Thinning

Aging Management Programs

The aging effects for components in the Plant Heating System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)
* Boric Acid Corrosion (B2.1.4)
* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* One-Time Inspection (B2.1.20)
* Selective Leaching (B2.1.21)
* TLAA
* Water Chemistry (B2.1.2)

3.4.2.1.11 Steam Drain System

Materials

Components in the Steam Drain System are constructed of the following materials:

* Glass
* Stainless Steel
* Steel

Environments

Components in the Steam Drain System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Steam Drain System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Wall Thinning

Aging Management Programs

The aging effects for components in the Steam Drain System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

* External Surfaces Monitoring of Mechanical Components (B2.1.23)
* Flow-Accelerated Corrosion (B2.1.8)
* One-Time Inspection (B2.1.20)
* TLAA
* Water Chemistry (B2.1.2)

3.4.2.1.12 Steam Seal System

Materials

Components in the Steam Seal System are constructed of the following materials:

* Ductile Iron
* Stainless Steel
* Steel

Environments

Components in the Steam Seal System are exposed to the following environments:

* Air – Indoor Uncontrolled
* Treated Water
* Treated Water >60°C (>140°F)

Aging Effects Requiring Management

Components in the Steam Seal System require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage
* Long-Term Loss of Material
* Loss of Material
* Loss of Preload
* Wall Thinning

Aging Management Programs

The aging effects for components in the Steam Seal System are managed by the following AMPs:

* Bolting Integrity (B2.1.9)

- External Surfaces Monitoring of Mechanical Components (B2.1.23)
- Flow-Accelerated Corrosion (B2.1.8)
- One-Time Inspection (B2.1.20)
- Selective Leaching (B2.1.21)
- TLAA
- Water Chemistry (B2.1.2)

3.4.2.2 Further Evaluation of Aging Management as Recommended by NUREG-2192

NUREG-2192 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the SLRA. For the Steam and Power Conversion features, those evaluations are addressed in the following sections. Italicized text is taken directly from NUREG-2192.

3.4.2.2.1 Cumulative Fatigue Damage

NUREG-2192

Evaluations involving time-dependent fatigue or cyclical loading parameters may be time-limited aging analyses (TLAAs), as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). This TLAA is addressed separately in SRP-SLR Section 4.3, "Metal Fatigue," or Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses." For plant-specific cumulative usage factor calculations that are based on stress-based input methods, the methods are to be appropriately defined and discussed in the applicable TLAAs.

Evaluation:

[3.4.1-001] - Fatigue of steam and power conversion systems components is a TLAA, as defined in 10 CFR 54.3. The evaluation of this TLAA is addressed in Section 4.3.3, "Non-Class 1 Piping Fatigue Analyses".

3.4.2.2.2 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

NUREG-2192

Cracking due to stress corrosion cracking (SCC) could occur in indoor or outdoor stainless steel (SS) piping, piping components, and tanks exposed to any air, condensation, or underground environment when the component is: (a) uninsulated; (b) insulated; (c) in the vicinity of insulated components; or (d) in the vicinity of potentially transportable halogens. Cracking can occur in environments containing sufficient halides (e.g., chlorides) in the presence of moisture.

Insulated SS components exposed to indoor air, outdoor air, condensation, or underground environments are susceptible to SCC if the insulation contains certain contaminants. Leakage of fluids through bolted connections (e.g., flanges, valve packing) can result in contaminants present in the insulation leaching onto the component surface or the surfaces of other components below the component. For outdoor insulated SS components, rain and changing weather conditions can result in moisture intrusion into the insulation.

Plant-specific operating experience (OE) and the condition of SS components are evaluated to determine if prolonged exposure to the plant-specific environments has resulted in SCC. SCC in SS components is not an aging effect requiring management if (a) plant-specific OE does not reveal a history of SCC and (b) a one-time inspection demonstrates that the aging effect is not occurring.

In the environment of air-indoor controlled, SCC is only expected to occur as the result of a source of moisture and halides. Inspections focus on the most susceptible locations. The applicant documents the results of the plant-specific OE review in the SLRA.

The GALL-SLR Report recommends further evaluation of SS piping, piping components, and tanks exposed to an air, condensation, or underground environment to determine whether an AMP is needed to manage the aging effect of SCC. The GALL-SLR Report AMP XI.M32, "One-Time Inspection," describes an acceptable program to demonstrate that SCC is not occurring. If SCC is occurring, the following AMPs describe acceptable programs to manage loss of material due to SCC: (a) GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," for tanks; (b) GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," for external surfaces of piping and piping components; (c) GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," for underground piping, piping components and tanks; and (d) GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," for internal surfaces of components that are not included in other AMPs. The timing of the one-time or periodic inspections is consistent with that recommended in the AMP selected by the applicant during the development of the SLRA. For example, one-time inspections would be conducted between the 50th and 60th year of operation, as recommended by the "detection of aging effects" program element in AMP XI.M32.

The applicant may establish that SCC is not an aging effect requiring management for all components, by demonstrating that a barrier coating isolates the component from aggressive environments. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. The GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," describes an acceptable program to manage the integrity of a barrier coating.

Evaluation:

A review of ONS operating experience confirmed that cracking due to stress corrosion cracking has not been identified in stainless steel piping, piping components, and tanks exposed to air, condensation, or underground environments in ONS steam and power conversion systems.

[3.4.1-002] - ONS has no stainless steel piping, piping components, or tanks exposed to air or condensation in the scope of SLR in steam and power conversion systems. Components in the steam and power conversion system are insulated and are aligned to item 3.4.1-104.

[3.4.1-074] - ONS has no stainless steel or nickel alloy underground piping, piping components, or tanks in an underground environment in the scope of SLR in steam and power conversion systems.

[3.4.1-100] - ONS has no stainless steel tanks within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks" in the scope of SLR in steam and power conversion systems.

[3.4.1-104] – The *One-Time Inspection* (B2.1.20) program will be implemented to confirm cracking due to stress corrosion cracking insulated stainless steel piping, piping components, and tanks exposed to air or condensation is not occurring.

3.4.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion in Stainless Steel and Nickel Alloys

NUREG-2192

Loss of material due to pitting and crevice corrosion could occur in indoor or outdoor SS and nickel alloy piping, piping components, and tanks exposed to any air, condensation, or underground environment when the component is: (a) uninsulated; (b) insulated; (c) in the vicinity of insulated components; or (d) in the vicinity of potentially transportable halogens. Loss of material due to pitting and crevice corrosion can occur on SS and nickel alloys in environments containing sufficient halides (e.g., chlorides) in the presence of moisture.

Insulated SS and nickel alloy components exposed to air, condensation, or underground environments are susceptible to loss of material due to pitting or crevice corrosion if the insulation contains certain contaminants. Leakage of fluids through mechanical connections such as bolted flanges and valve packing can result in contaminants leaching onto the component surface or the surfaces of other components below the component. For outdoor insulated SS and nickel alloy components, rain and changing weather conditions can result in moisture intrusion into the insulation.

Plant-specific OE and the condition of SS and nickel alloy components are evaluated to determine if prolonged exposure to the plant-specific environments has resulted in pitting or crevice corrosion. Loss of material due to pitting and crevice corrosion is not an aging effect requiring management for SS and nickel alloy components if (a) plant-specific OE does not reveal a history of loss of material due to pitting or crevice corrosion; and (b) a one-time inspection demonstrates that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components during the subsequent period of extended operation. The applicant documents the results of the plant specific OE review in the SLRA.

In the environment of air-indoor controlled, pitting and crevice corrosion is only expected to occur as the result of a source of moisture and halides. Inspections focus on the most susceptible locations.

The GALL-SLR Report recommends further evaluation of SS and nickel alloy piping, piping components, and tanks exposed to an air, condensation, or underground environment to determine whether an AMP is needed to manage the aging effect of loss of material due to pitting and crevice corrosion. GALL-SLR Report AMP XI.M32, “One-Time Inspection,” describes an acceptable program to demonstrate that loss of material due to pitting and crevice corrosion is not occurring at a rate that affects the intended function of the components. If loss of material due to pitting or crevice corrosion has occurred and is sufficient to potentially affect the intended function of an SSC, the following AMPs describe acceptable programs to manage loss of material due to pitting or crevice corrosion: (a) GALL-SLR Report AMP XI.M29, “Outdoor and

Large Atmospheric Metallic Storage Tanks," for tanks; (b) GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," for external surfaces of piping and piping components; (c) GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," for underground piping, piping components and tanks; and (d) GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," for internal surfaces of components that are not included in other AMPs. The timing of the one-time or periodic inspections is consistent with that recommended in the AMP selected by the applicant during the development of the SLRA. For example, one-time inspections would be conducted between the 50th and 60th year of operation, as recommended by the "detection of aging effects" program element in AMP XI.M32.

The applicant may establish that loss of material due to pitting and crevice corrosion is not an aging effect requiring management by demonstrating that a barrier coating isolates the component from aggressive environments. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," describes an acceptable program to manage the integrity of a barrier coating.

<u>Evaluation:</u>

A review of ONS OE confirmed that pitting and crevice corrosion has not occurred on surfaces of stainless steel piping, piping components, and tanks exposed to air, condensation, or underground environments in ONS steam and power conversion systems, or in reactor vessel, internals, and reactor coolant system components aligned to this section.

[3.4.1-003] - The *One-Time Inspection* (B2.1.20) program will be implemented to confirm pitting and crevice corrosion of stainless steel piping, piping components, and tanks exposed to air or condensation is not occurring.

[3.4.1-095] - ONS has no stainless steel or nickel alloy piping, piping components, or tanks in an underground environment in the scope of SLR in steam and power conversion systems.

[3.4.1-098] - ONS has no stainless steel or nickel alloy tanks within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks" in the scope of SLR in steam and power conversion systems.

[3.4.1-103] – The *One-Time Inspection* (B2.1.20) program will be implemented to confirm pitting and crevice corrosion of insulated stainless steel piping, piping components, and tanks exposed to air or condensation is not occurring.

3.4.2.2.4 Quality Assurance for Aging Management of Non-Safety Related Components

NUREG-2192

Acceptance criteria are described in Branch Technical Position (BTP) IQMB-1 (Appendix A.2 of this SRP-SLR).

Evaluation:

Quality Assurance provisions applicable to SLR are discussed in Appendix B1.3, Quality Assurance Program and Administrative Controls.

3.4.2.2.5 Ongoing Review of Operating Experience

NUREG-2192

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

Evaluation:

The OE process and acceptance criteria are described in Appendix B1.4, Operating Experience.

3.4.2.2.6 Loss of Material Due to Recurring Internal Corrosion

Recurring internal corrosion can result in the need to augment AMPs beyond the recommendations in the GALL-SLR Report. During the search of plant-specific OE conducted during the SLRA development, recurring internal corrosion can be identified by the number of occurrences of aging effects and the extent of degradation at each localized corrosion site. This further evaluation item is applicable if the search of plant specific OE reveals repetitive occurrences. The criteria for recurrence is (a) a 10 year search of plant specific OE reveals the aging effect has occurred in three or more refueling outage cycles; or (b) a 5 year search of plant specific OE reveals the aging effect has occurred in two or more refueling outage cycles and resulted in the component either not meeting plant specific acceptance criteria or experiencing a reduction in wall thickness greater than 50 percent (regardless of the minimum wall thickness).

The GALL-SLR Report recommends that GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," be evaluated for inclusion of augmented requirements to ensure the adequate management of any recurring aging effect(s). Alternatively, a plant-specific AMP may be proposed. Potential augmented requirements include: (i) alternative examination methods (e.g., volumetric versus external visual); (ii) augmented inspections (e.g., a greater number of locations, additional locations based on risk insights based on susceptibility to aging effect and consequences of failure, a greater frequency of inspections), *and (iii) additional trending parameters and decision points where increased inspections would be implemented.*

The applicant states: (a) why the program's examination methods will be sufficient to detect the recurring aging effect before affecting the ability of a component to perform its intended function, (b) the basis for the adequacy of augmented or lack of augmented inspections, (c) what parameters will be trended as well as the decision points where increased inspections would be implemented (e.g., the extent of degradation at individual corrosion sites, the rate of degradation change), (d) how inspections of components that are not easily accessed (i.e., buried, underground) will be conducted, and (e) how leaks in any involved buried or underground components will be identified.

Plant-specific OE examples should be evaluated to determine if the chosen AMP should be augmented even if the thresholds for significance of aging effect or frequency of occurrence of aging effect have not been exceeded. For example, during a 10 year search of plant-specific OE, two instances of a 360 degree 30 percent wall loss occurred at copper alloy to steel joints. Neither the significance of the aging effect nor the frequency of occurrence of aging effect threshold has been exceeded. Nevertheless, the OE should be evaluated to determine if the AMP that is proposed to manage the aging effect is sufficient (e.g., method of inspection, frequency of inspection, number of inspections) to provide reasonable assurance that the current licensing basis (CLB) intended functions of the component will be met throughout the subsequent period of extended operation. While recurring internal corrosion is not as likely in other environments as raw water and waste water (e.g., treated water), the aging effect should be addressed in a similar manner.

Evaluation:

[3.4.1-061] - A review of plant OE has not identified recurring internal corrosion of metallic piping, piping components, or tanks exposed to raw water or waste water in the steam and power conversion systems.

3.4.2.2.7 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

NUREG-2192:

SCC is a form of environmentally assisted cracking which is known to occur in high and moderate strength aluminum alloys. The three conditions necessary for SCC to occur in a component are a sustained tensile stress, aggressive environment, and material with a susceptible microstructure. Cracking due to SCC can be mitigated by eliminating one of the three necessary conditions. For the purposes of SLR, acceptance criteria for this further evaluation is being provided for demonstrating that the specific material is not susceptible to SCC or an aggressive environment is not present. Cracking due to SCC is an aging effect requiring management unless it is demonstrated by the applicant that one of the two necessary conditions discussed below is absent.

Susceptible Material: If the material is not susceptible to SCC, then cracking is not an aging effect requiring management. The microstructure of an aluminum alloy, of which alloy composition is only one factor, is what determines whether the alloy is susceptible to SCC. Therefore, determining susceptibility based on alloy composition alone is not adequate to conclude whether a particular material is susceptible to SCC. The temper, condition, and product form of the alloy is considered when assessing if a material is susceptible to SCC. Aluminum alloys that are susceptible to SCC include:

- 2xxx series alloys in the F, W, Ox, T3x, T4x, or T6x temper
- 5xxx series alloys with a magnesium content of 3.5 weight percent or greater
- 6xxx series alloys in the F temper
- 7xxx series alloys in the F, T5x, or T6x temper
- 2xx.x and 7xx.x series alloys
- 3xx.x series alloys that contain copper
- 5xx.x series alloys with a magnesium content of greater than 8 weight percent

The material is evaluated to verify that it is not susceptible to SCC and that the basis used to make the determination is technically substantiated. Tempers have been specifically developed to improve the SCC resistance for some aluminum alloys. Aluminum alloy and temper combination which are not susceptible to SCC when used in piping, piping component, and tank applications include 1xxx series, 3xxx series, 6061-T6x, and 5454-x. If it is determined that a material is not susceptible to SCC, the SLRA provides the components/locations where it is used, alloy composition, temper or condition, product form, and for tempers not addressed above, the basis used to determine the alloy is not susceptible and technical information substantiating the basis.

Aggressive Environment: If the environment to which an aluminum alloy is exposed is not aggressive, such as dry gas or treated water, then cracking due to SCC will not occur and it is not an aging effect requiring management. Aggressive environments that are known to result in cracking due to SCC of susceptible aluminum alloys are aqueous solutions, air, condensation, and underground locations that contain halides (e.g., chloride). Halide concentrations should be considered high enough to facilitate SCC of aluminum alloys in uncontrolled or untreated aqueous solutions and air, such as raw water, waste water, condensation, underground locations, and outdoor air, unless demonstrated otherwise.

Halides could be present on the surface of the aluminum material if the component is encapsulated in a material such as insulation or concrete. In a controlled or uncontrolled indoor air, condensation, or underground environment, sufficient halide concentrations to cause SCC could be present due to secondary sources such as leakage from nearby components (e.g., leakage from insulated flanged connections or valve packing). If an aluminum component is exposed to a halide-free indoor air environment, not encapsulated in materials containing halides, and the exposure to secondary sources of moisture or halides is precluded, cracking due to SCC is not expected to occur. The plant-specific configuration can be used to demonstrate that exposure to halides will not occur. If it is determined that SCC will not occur because the environment is not aggressive, the SLRA provides the components and locations exposed to the environment, description of the environment, basis used to determine the environment is not *aggressive, and technical information substantiating the basis. GALL-SLR Report AMP XI.M32, "One-Time Inspection," and a review of plant-specific OE describe an acceptable means to confirm the absence of moisture or halides within the proximity of the aluminum component.*

If the environment potentially contains halides, the GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," describes an acceptable program to manage cracking due to SCC of aluminum tanks. The GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," describes an acceptable program to manage cracking due to SCC of aluminum piping and piping components. The GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," describes an acceptable program to manage cracking due to SCC of aluminum piping and tanks, which are buried or underground. GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" describes an acceptable program to manage cracking due to SCC of aluminum components that are not included in other AMPs.

An alternative strategy to demonstrating that an aggressive environment is not present is to isolate the aluminum alloy from the environment using a barrier to prevent SCC. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," describes an acceptable program to manage the integrity of a barrier coating for internal or external coatings.

Evaluation:

[3.4.1-102] – ONS has no in-scope aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to air, condensation, soil, concrete, raw water or waste water in the steam and power conversion systems.

[3.4.1-105] - ONS has no insulated aluminum piping, piping components, or tanks exposed to air or condensation environments in scope of SLR in steam and power conversion systems.

[3.4.1-109] – ONS has no aluminum alloy piping, piping components, or tanks exposed to air, condensation, raw water or waste water environments in the scope of SLR in steam and power conversion systems.

[3.4.1-112] – ONS has no aluminum underground piping, piping components or tanks in the scope of SLR in steam and power conversion systems.

3.4.2.2.8 Loss of Material Due to General, Crevice or Pitting Corrosion and Cracking Due to Stress Corrosion Cracking

NUREG-2192:

Loss of material due to general (steel only), Crevice, or pitting corrosion and cracking due to SCC (SS only) can occur in steel and SS piping and piping components exposed to concrete. Concrete provides a high alkalinity environment that can mitigate the effects of loss of material for steel piping, thereby significantly reducing the corrosion rate. However, if water intrudes through the concrete, the pH can be reduced and ions that promote loss of material such as chlorides, which can penetrate the protective oxide layer created in the high alkalinity environment, can reach the surface of the metal. Carbonation can reduce the pH within concrete. The rate of carbonation is reduced by using concrete with a low water-to-cement ratio and low permeability. Concrete with low permeability also reduces the potential for the penetration of water. Adequate air entrainment improves the ability of the concrete to resist freezing and thawing cycles and therefore reduces the potential for cracking and intrusion of water, Cracking due to SCC, as well as pitting and crevice corrosion can occur due to halides present in the water that penetrates to the surface of the metal.

If the following conditions are met, loss of material is not considered to be an applicable aging effect for steel: (a) attributes of the concrete are consistent with American Concrete Institute (ACI) 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557; (b) plant-specific OE indicates no degradation of the concrete that could lead to penetration of water to the metal surface; and (c) the piping is not potentially exposed to groundwater. Where these conditions are not met, loss of material due to general (steel only), crevice, or pitting corrosion, and cracking due to SCC (SS only) are identified as applicable aging effects. GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," describes an acceptable program to manage these aging effects.

Evaluation:

[3.4.1-051] – The steel components aligned to this item are condensate piping and the main condenser shell. Loss of material of is not considered to be an applicable aging effect for these components based on the following consideration: (a) the concrete in areas containing these components conforms to ACI 349 or ACI 318; (b) review of ONS operating experience did not identify degradation of concrete around embedded components that could lead to penetration of water; and (c) these components are not exposed to a soil environment. Steel components that do not exit the concrete into soil are not potentially exposed to groundwater.

[3.4.1-082] – ONS has no stainless steel piping components exposed to concrete in the scope of SLR in steam and power conversion systems.

3.4.2.2.9 Loss of Material Due to Pitting and Crevice Corrosion in Aluminum Alloys

NUREG-2192:

Loss of material due to pitting and crevice corrosion could occur in aluminum piping, piping components, and tanks exposed to an air, condensation, underground, raw water, or waste water environment for a sufficient duration of time. Environments that can result in pitting and/or crevice corrosion of aluminum alloys are those that contain halides (e.g., chloride) in the presence of moisture. The moisture level and halide concentration in atmospheric and uncontrolled air are greatly dependent on geographical location and site-specific conditions. Moisture level and halide concentration should be considered high enough to facilitate pitting and/or crevice corrosion of aluminum alloys in atmospheric and uncontrolled air, unless demonstrated otherwise. The periodic introduction of moisture or halides into an environment from secondary sources should also be considered. Leakage of fluids from mechanical connections (e.g., insulated bolted flanges and valve packing): onto a component in indoor controlled air is an example of a secondary source that should be considered. Halide concentrations should be considered high enough to facilitate loss of material of aluminum alloys in untreated aqueous solutions, unless demonstrated otherwise. Plant-specific OE and the condition of aluminum alloy components are evaluated to determine if prolonged exposure to the plant-specific air, condensation, underground, or water environments has resulted in pitting or crevice corrosion. Loss of material due to pitting and crevice corrosion is not an aging effect requiring management for aluminum alloys if (a) plant-specific OE does not reveal a history of loss of material due to pitting or crevice corrosion and (b) a one-time inspection demonstrates that the aging effect is not occurring or is occurring so slowly that it will not affect the intended function of the components. The applicant documents the results of the plant-specific OE review in the SLRA.

In the environment of air-indoor controlled, pitting and crevice corrosion is only expected to occur as the result of a source of moisture and halides. Alloy susceptibility may be considered when reviewing OE and interpreting inspection results. Inspections focus on the most susceptible alloys and locations.

The GALL-SLR Report recommends the further evaluation of aluminum piping, piping components, and tanks exposed to an air, condensation, or underground environment to determine whether an AMP is needed to manage the aging effect of loss of material due to pitting and crevice corrosion. GALL-SLR Report AMP XI.M32, "One-Time Inspection," describes an acceptable program to demonstrate that the aging effect of loss of material due to pitting and crevice corrosion is not occurring at a rate that will affect the intended function of the components. If a loss of material due to pitting and crevice corrosion has occurred and is sufficient to potentially affect the intended function of an SSC, the following AMPs describe acceptable programs to manage loss of material due to pitting and crevice corrosion: (i) GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," for tanks; (ii) GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," for external surfaces of piping and piping components; (iii) GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," for underground piping, piping components and tanks; and (iv) GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous

Piping and Ducting Components," for internal surfaces of components that are not included in other AMPs. The timing of the one-time or periodic inspections is consistent with that recommended in the AMP selected by the applicant during the development of the SLRA. For example, one-time inspections would be conducted between the 50th and 60th year of operation, as recommended by the "detection of aging effects" program element in AMP XI.M32.

An alternative strategy to demonstrating that an aggressive environment is not present is to isolate the aluminum alloy from the environment using a barrier to prevent loss of material due to pitting and crevice corrosion. Acceptable barriers include tightly-adhering coatings that have been demonstrated to be impermeable to aqueous solutions and air that contain halides. The GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," describes an acceptable program to manage the integrity of a barrier coating.

Evaluation:

[3.4.1-035] – ONS has no aluminum alloy piping, piping components, or tanks exposed to air or condensation in the scope of SLR in steam and power conversion systems.

[3.4.1-094] – ONS has no aluminum underground piping, piping components or tanks in the scope of SLR in steam and power conversion systems.

[3.4.1-097] – ONS has no aluminum tanks (within the scope of AMP XI.M29, Outdoor and Large Atmospheric Metallic Storage Tanks) exposed to air or condensation in the scope of SLR in steam and power conversion systems.

[3.4.1-119] - ONS has no insulated aluminum piping, piping components, or tanks exposed to air or condensation in the scope of SLR in steam and power conversion systems.

[3.4.1-120] – ONS has no aluminum piping, piping components or tanks exposed to raw water or waste water in the scope of SLR in steam and power conversion systems.

Results Tables: Steam and Power Conversion Systems

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-001	Steel piping, piping components exposed to any environment	Cumulative fatigue damage due to fatigue	TLAA, SRP-SLR Section 4.3 Metal Fatigue	Yes (SRP-SLR Section 3.4.2.2.1)	Consistent with NUREG-2191. Fatigue of Steam and Power Systems components is a time-limited aging analysis (TLAA), as defined in 10 CFR 54.3. The evaluation of this TLAA is addressed in Section 4.3. See further evaluation in Section 3.4.2.2.1.
3.4.1-002	Stainless steel piping, piping components, tanks exposed to air, condensation	Cracking due to SCC	AMP XI.M32, “One-Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.4.2.2.2)	Not applicable. ONS has no stainless steel piping, piping components, or tanks exposed to air or condensation in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used. Components in the Steam and Power Conversion system are insulated and are aligned to item 3.4.1-104. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-003	Stainless steel, nickel alloy piping, piping components, tanks exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M32, “One-Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.4.2.2.3)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that loss of material is not occurring in stainless steel components exposed to air-indoor uncontrolled (external) environments. See further evaluation in Section 3.4.2.2.3.
3.4.1-004	Steel external surfaces exposed to air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, “Boric Acid Corrosion”	No	Consistent with NUREG-2191.
3.4.1-005	Steel piping, piping components exposed to steam, treated water	Wall thinning due to flow-accelerated corrosion	AMP XI.M17, “Flow-Accelerated Corrosion”	No	Consistent with NUREG-2191.
3.4.1-006	Metallic closure bolting exposed to any environment, soil, underground	Loss of preload due to thermal effects, gasket creep, self-loosening	AMP XI.M18, “Bolting Integrity”	No	Consistent with NUREG-2191.
3.4.1-007	High-strength steel closure bolting exposed to air, soil, underground	Cracking due to SCC; cyclic loading	AMP XI.M18, “Bolting Integrity”	No	Consistent with NUREG-2191.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-009	Steel, stainless steel, nickel alloy closure bolting exposed to air-indoor uncontrolled, air-outdoor, condensation	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M18, “Bolting Integrity”	No	Consistent with NUREG-2191.
3.4.1-011	Stainless steel piping, piping components, tanks, heat exchanger components exposed to steam, treated water >60°C (>140°F)	Cracking due to SCC	AMP XI.M2, “Water Chemistry,” and AMP-XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191. In addition to Steam and Power Conversion Systems, components in Auxiliary Systems are aligned to this item.
3.4.1-012	Steel tanks exposed to treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, “Water Chemistry,” and AMP-XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191. In addition to Steam and Power Conversion systems, components in Auxiliary Systems are aligned to this item.
3.4.1-014	Steel piping, piping components exposed to steam, treated water	Loss of material due to general, pitting, crevice corrosion, MIC (treated water only)	AMP XI.M2, “Water Chemistry,” and AMP-XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191. In addition to Steam and Power Conversion Systems, components in Reactor Vessel, Internals, And Reactor Coolant System and Auxiliary Systems are aligned to this item.
3.4.1-015	Steel heat exchanger components exposed to treated water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M2, “Water Chemistry,” and AMP-XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191. In addition to Steam and Power Conversion Systems, components in Auxiliary Systems are aligned to this item.
3.4.1-016	Copper alloy, aluminum piping, piping components exposed to treated water, treated borated water	Loss of material due to pitting, crevice corrosion, MIC (copper alloy only)	AMP XI.M2, “Water Chemistry,” and AMP-XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191. In addition to Steam and Power Conversion Systems, components in Auxiliary Systems are aligned to this item.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-018	Copper alloy, stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP-XI.M32, "One-Time Inspection"	No	Consistent with NUREG-2191.
3.4.1-019	Stainless steel, steel heat exchanger components exposed to raw water	Loss of material due to general (copper alloy only), pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.
3.4.1-020	Copper alloy, stainless steel piping, piping components exposed to raw water	Loss of material due to general (copper alloy only), pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No	Not applicable. ONS has no copper alloy, stainless steel piping, piping components exposed to raw water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-022	Stainless steel, copper alloy, steel heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Open-Cycle Cooling Water System* (B2.1.11) program implementation.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-023	Stainless steel piping, piping components exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to SCC	AMP XI.M21A, “Closed Treated Water Systems”	No	Consistent with NUREG-2191.
3.4.1-025	Steel heat exchanger components exposed to closed-cycle cooling water	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M21A, “Closed Treated Water Systems”	No	Consistent with NUREG-2191.
3.4.1-026	Stainless steel heat exchanger components, piping, piping components exposed to closed-cycle cooling water	Loss of material due to pitting, crevice corrosion	AMP XI.M21A, “Closed Treated Water Systems”	No	Consistent with NUREG-2191.
3.4.1-027	Copper alloy piping, piping components exposed to closed-cycle cooling water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M21A, “Closed Treated Water Systems”	No	Consistent with NUREG-2191.
3.4.1-028	Steel, stainless steel, copper alloy heat exchanger tubes exposed to closed-cycle cooling water	Reduction of heat transfer due to fouling	AMP XI.M21A, “Closed Treated Water Systems”	No	Not applicable. ONS has no steel, stainless steel, or copper alloy heat exchanger tubes exposed to closed-cycle cooling water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-030	Steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil, concrete, air, condensation	Loss of material due to general, pitting, crevice corrosion, MIC (soil only)	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks"	No	Not applicable. ONS has no steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil, concrete, air, condensation in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-032	Gray cast iron, ductile iron piping, piping components exposed to soil	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No	Not applicable. ONS has no gray cast iron or ductile iron piping, piping components exposed to soil in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-033	Gray cast iron, ductile iron, copper alloy (>15% Zn or >8% Al) piping, piping components exposed to treated water, raw water, closed-cycle cooling water	Loss of material due to selective leaching	AMP XI.M33, "Selective Leaching"	No	Consistent with NUREG-2191.
3.4.1-034	Steel external surfaces exposed to air-indoor uncontrolled, air-outdoor, condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-2191. In addition to Steam and Power Conversion Systems, components in Reactor Vessel, Internals, And Reactor Coolant System are aligned to this item.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-035	Aluminum piping, piping components, tanks exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M32, “One-Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components," AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.4.2.2.9)	Not applicable. ONS has no aluminum alloy piping, piping components, or tanks exposed to air or condensation in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-036	Steel piping, piping components exposed to air - outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no steel piping or piping components exposed to air – outdoor in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-037	Steel piping, piping components exposed to condensation	Loss of material due to general, pitting, crevice corrosion	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Consistent with NUREG-2191.
3.4.1-038	Steel piping, piping components exposed to raw water	Loss of material due to general, pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M20, “Open-Cycle Cooling Water System”	No	Not applicable. ONS has no steel piping, piping components exposed to raw water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-040	Steel piping, piping components exposed to lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191.
3.4.1-041	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. ONS has no steel heat exchanger components exposed to lubricating oil in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-042	Aluminum piping, piping components exposed to lubricating oil	Loss of material due to pitting, crevice corrosion	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. ONS has no aluminum piping, piping components exposed to lubricating oil in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-043	Copper alloy piping, piping components exposed to lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191.
3.4.1-044	Stainless steel piping, piping components, heat exchanger components exposed to lubricating oil	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M39, “Lubricating Oil Analysis,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. ONS has no stainless steel piping, piping components, or heat exchanger components exposed to lubricating oil in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-045	Aluminum heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No	Not applicable. ONS has no aluminum heat exchanger tubes exposed to lubricating oil in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-046	Stainless steel, steel, copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	AMP XI.M39, "Lubricating Oil Analysis," and AMP XI.M32, "One-Time Inspection"	No	Not applicable. ONS has no stainless steel, steel, or copper alloy heat exchanger tubes exposed to lubricating oil in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-047	Stainless steel piping, piping components, tanks, closure bolting exposed to soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no stainless steel piping, piping components, tanks, closure bolting exposed to soil or concrete in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-048	Nickel alloy piping, piping components, tanks, closure bolting exposed to soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no nickel alloy piping, piping components, tanks, or closure bolting exposed to soil, concrete in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-050	Steel piping, piping components, tanks, closure bolting exposed to soil, concrete, underground	Loss of material due to pitting, crevice corrosion, MIC (soil only)	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no steel piping, piping components, tanks, or closure bolting exposed to soil or underground environments in the scope of subsequent license renewal in Steam And Power Conversion systems. Steam And Power Conversion components exposed to concrete are aligned with item 3.4.1-051. The associated NUREG-2191 aging items are not used.
3.4.1-051	Steel piping, piping components exposed to concrete	None	None	Yes (SRP-SLR Section 3.4.2.2.8)	Consistent with NUREG-2191. See further evaluation in Section 3.4.2.2.8.
3.4.1-052	Aluminum piping, piping components exposed to gas	None	None	No	Not applicable. ONS has no aluminum piping, piping components exposed to gas in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-053	Copper alloy, copper alloy (>8% Al) piping, piping components exposed to air with borated water leakage	None	None	No	Not applicable. ONS has no copper alloy, copper alloy (>8% Al) piping, piping components exposed to air with borated water leakage in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-054	Copper alloy piping, piping components exposed to air, condensation, gas	None	None	No	Consistent with NUREG-2191.
3.4.1-055	Glass piping elements exposed to lubricating oil, air, condensation, raw water, treated water, air with borated water leakage, gas, closed-cycle cooling water	None	None	No	Consistent with NUREG-2191.
3.4.1-056	Nickel alloy piping, piping components exposed to air with borated water leakage	None	None	No	Not applicable. ONS has no nickel alloy piping, piping components exposed to air with borated water leakage in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-057	PVC piping, piping components exposed to air - indoor uncontrolled, condensation	None	None	No	Not applicable. ONS has no PVC piping or piping components exposed to air – indoor uncontrolled, or condensation in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-058	Stainless steel piping, piping components exposed to gas	None	None	No	Not applicable. ONS has no stainless steel piping or piping components exposed to gas in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-059	Steel piping, piping components exposed to air - indoor controlled, gas	None	None	No	Not applicable. ONS has no steel piping or piping components exposed to air – indoor controlled or gas in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-060	Metallic piping, piping components exposed to steam, treated water	Wall thinning due to erosion	AMP XI.M17, “Flow-Accelerated Corrosion”	No	Consistent with NUREG-2191.
3.4.1-061	Metallic piping, piping components, tanks exposed to raw water, waste water	Loss of material due to recurring internal corrosion	AMP XI.M20, “Open-Cycle Cooling Water System,” or AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	Yes (SRP-SLR Section 3.4.2.2.6)	Not applicable. Loss of material due to recurring internal corrosion has not been identified within metallic piping, piping components, or tanks exposed to raw water or waste water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-062	Steel, stainless steel or aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to treated water	Loss of material due to general (steel only), pitting, crevice corrosion, MIC (steel, stainless steel only)	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks"	No	Not applicable. ONS has no steel, stainless steel or aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to treated water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-063	Insulated steel, copper alloy (>15% Zn or >8% Al), piping, piping components, tanks, tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to air, condensation	Loss of material due to general, pitting, crevice corrosion (steel only); cracking due to SCC (copper alloy (>15% Zn or >8% Al) only)	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components" AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks"	No	Not applicable. ONS has no copper alloy (>15% Zn or >8% Al), piping, piping components, or tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") in the scope of subsequent license renewal in Steam and Power Conversion systems. Insulated steel piping, piping components or tanks exposed to air or condensation in the Steam and Power Conversion systems are aligned to item 3.4.1-034. The associated NUREG-2191 aging items are not used.
3.4.1-064	Non-metallic thermal insulation exposed to air, condensation	Reduced thermal insulation resistance due to moisture intrusion	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. ONS has no non-metallic thermal insulation with a thermal resistance intended function in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-066	Any material piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage; loss of material or cracking for cementitious coatings/linings	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (B2.1.27) program implementation. In addition, Condensate System components using a different aging management program were aligned to 3.4.1-066 and 3.4.1-067: • Main Condenser outlet waterbox and tubesheet coatings are managed by the *Open Cycle Cooling Water System* (B2.1.11) program. • Powdex and Slurry Tanks coatings are managed by *Water Chemistry* (B2.1.2) program and *One-Time Inspection* (B2.1.20) program.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-067	Any material piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, lubricating oil	Loss of material due to general, pitting, crevice corrosion, MIC	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Consistent with NUREG-2191 with exceptions. Exceptions apply to the NUREG-2191 recommendations for the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (B2.1.27) program implementation. In addition, Condensate System components using a different aging management program were aligned to this item. See SRP Item 3.4.1-066 for additional information.
3.4.1-068	Gray cast iron, ductile iron piping, piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, waste water	Loss of material due to selective leaching	AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Not applicable. ONS has no gray cast iron, ductile iron piping, piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, waste water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-070	Stainless steel, steel, nickel alloy, copper alloy closure bolting exposed to lubricating oil, treated water, treated borated water, raw water, waste water	Loss of material due to general (steel; copper alloy in raw water, waste water only), pitting, crevice corrosion, MIC (raw water, waste water environments only)	AMP XI.M18, “Bolting Integrity”	No	Not applicable. ONS has no stainless steel, steel, nickel alloy, copper alloy closure bolting exposed to lubricating oil, treated water, treated borated water, raw water, or waste water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-072	Stainless steel, steel, aluminum piping, piping components, tanks exposed to soil, concrete	Cracking due to SCC (steel in carbonate/ bicarbonate environment only)	AMP XI.M41, “Buried and Underground Piping and Tanks”	No	Not applicable. ONS has no stainless steel, steel, aluminum piping, piping components, tanks exposed to soil, concrete environment, or steel exposed to a carbonate/bicarbonate environment in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-073	Stainless steel closure bolting exposed to air, soil, concrete, underground, waste water	Cracking due to SCC	AMP XI.M18, “Bolting Integrity”	No	Consistent with NUREG-2191.
3.4.1-074	Stainless steel underground piping, piping components, tanks	Cracking due to SCC	AMP XI.M32, “One-Time Inspection,” AMP XI.M41, “Buried and Underground Piping and Tanks,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.4.2.2.2)	Not applicable. ONS has no stainless steel piping, piping components, or tanks in an underground environment in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-075	Stainless steel, steel, aluminum, copper alloy, titanium heat exchanger tubes exposed to air, condensation	Reduction of heat transfer due to fouling	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Not applicable. ONS has no stainless steel, steel, aluminum, copper alloy, titanium heat exchanger tubes exposed to air or condensation, where the tubes have a heat transfer intended function, in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-077	Elastomer piping, piping components, seals exposed to air, condensation	Hardening or loss of strength due to elastomer degradation	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Not applicable. ONS has no elastomer piping, piping components, seals exposed to air or condensation in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-078	Elastomer piping, piping components, seals exposed to air, condensation	Hardening or loss of strength due to elastomer degradation	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no elastomer piping, piping components, seals exposed to air or condensation in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-081	Steel components exposed to treated water, raw water	Long-term loss of material due to general corrosion	AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-082	Stainless steel piping, piping components exposed to concrete	None	None	Yes (SRP-SLR Section 3.4.2.2.8)	Not applicable. ONS has no stainless steel piping components exposed to concrete in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-083	Stainless steel, nickel alloy tanks exposed to treated water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191. In addition to Steam and Power Conversion systems, components in Auxiliary Systems are aligned to this item.
3.4.1-084	Stainless steel, nickel alloy piping, piping components exposed to steam	Loss of material due to pitting, crevice corrosion	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Not applicable. Steam environments in the Steam and Power Conversion systems are evaluated as treated water and are aligned to Item 3.4-1, 085. The associated NUREG-2191 aging items are not used. The associated NUREG-2191 aging items are not used.
3.4.1-085	Stainless steel, nickel alloy piping, piping components, PWR heat exchanger components exposed to treated water	Loss of material due to pitting, crevice corrosion, MIC	AMP XI.M2, “Water Chemistry,” and AMP XI.M32, “One-Time Inspection”	No	Consistent with NUREG-2191. In addition to Steam and Power Conversion system, components in Reactor Vessel, Internals, and Reactor Coolant System and Auxiliary Systems are aligned to this item.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-086	Stainless steel, steel, aluminum, copper alloy, titanium heat exchanger tubes internal to components exposed to air, condensation	Reduction of heat transfer due to fouling	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no stainless steel, steel, aluminum, copper alloy, or titanium heat exchanger tubes internal to components exposed to air or condensation in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-089	Steel, stainless steel, copper alloy piping, piping components exposed to raw water (for components not covered by NRC GL 89-13)	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no steel, stainless steel, or copper alloy piping or piping components exposed to raw water (for components not covered by NRC GL 89-13) in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-090	Steel, stainless steel, copper alloy heat exchanger tubes exposed to raw water (for components not covered by NRC GL 89-13)	Reduction of heat transfer due to fouling	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no steel, stainless steel, or copper alloy heat exchanger tubes exposed to raw water (for components not covered by NRC GL 89-13) in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-091	Steel, stainless steel, copper alloy heat exchanger components exposed to raw water (for components not covered by NRC GL 89-13)	Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion, MIC; flow blockage due to fouling	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no steel, stainless steel, or copper alloy heat exchanger components exposed to raw water (for components not covered by NRC GL 89-13) in the scope of subsequent license renewal in Steam and Power Conversion systems. Components in a raw water (potable) environment have been aligned to item 3.3.1-088. The associated NUREG-2191 aging items are not used.
3.4.1-092	Copper alloy (>15% Zn or >8% Al) piping, piping components exposed to soil	Loss of material due to selective leaching	AMP XI.M33, “Selective Leaching”	No	Not applicable. ONS has no copper alloy (>15% Zn or >8% Al) piping or piping components exposed to soil in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-094	Aluminum underground piping, piping components, tanks	Loss of material due to pitting, crevice corrosion	AMP XI.M32, “One-Time Inspection,” AMP XI.M41, “Buried and Underground Piping and Tanks,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.4.2.2.9)	Not applicable. ONS has no aluminum underground piping, piping components or tanks in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-095	Stainless steel, nickel alloy underground piping, piping components, tanks	Loss of material due to pitting, crevice corrosion	AMP XI.M32, "One-Time Inspection," AMP XI.M41, "Buried and Underground Piping and Tanks," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.4.2.2.3)	Not applicable. ONS has no stainless steel or nickel alloy piping, piping components, or tanks in an underground environment in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-096	Aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks"	No	Not applicable. ONS has no aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil or concrete in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-097	Aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," AMP XI.M41, "Buried and Underground Piping and Tanks," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.4.2.2.9)	Not applicable. ONS has no aluminum tanks (within the scope of AMP XI.M29, Outdoor and Large Atmospheric Metallic Storage Tanks) exposed to air or condensation in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-098	Stainless steel, nickel alloy tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” AMP XI.M41, “Buried and Underground Piping and Tanks,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.4.2.2.3)	Not applicable. ONS has no stainless steel or nickel alloy tanks within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks” in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-099	Stainless steel tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to soil, concrete	Loss of material due to pitting, crevice corrosion, MIC (soil only)	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”	No	Not applicable. ONS has no stainless steel tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to soil or concrete in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-100	Stainless steel tanks (within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks”) exposed to air, condensation	Cracking due to SCC	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” or AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.4.2.2.2)	Not applicable. ONS has no stainless steel tanks within the scope of AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks” in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-101	Stainless steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to air, condensation, soil, concrete, raw water, waste water	Cracking due to SCC	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks"	No	Not applicable. ONS has no stainless steel tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to soil or concrete in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-102	Aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to air, condensation, soil, concrete, raw water, waste water	Cracking due to SCC	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.4.2.2.7)	Not applicable. ONS has no aluminum tanks (within the scope of AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks") exposed to air, condensation, soil, concrete, raw water or waste water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-103	Insulated stainless steel, nickel alloy piping, piping components, tanks exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," or AMP XI.M42, "Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.4.2.2.3)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that loss of material is not occurring in insulated stainless steel or nickel alloy components exposed to air-indoor uncontrolled (external) environments. In addition to Steam and Power Conversion system, components in Reactor Vessel, Internals, and Reactor Coolant System are aligned to this item. See further evaluation in Section 3.4.2.2.3.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-104	Insulated stainless steel piping, piping components, tanks exposed to air, condensation	Cracking due to SCC	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.4.2.2.2)	Consistent with NUREG-2191. The *One-Time Inspection* program (B2.1.20) will be implemented to confirm that cracking due to SCC is not occurring in insulated stainless steel components exposed to air-indoor uncontrolled (external) environments. In addition to Steam and Power Conversion system, components in Reactor Vessel, Internals, and Reactor Coolant System are aligned to this item. See further evaluation in Section 3.4.2.2.2.
3.4.1-105	Insulated aluminum piping, piping components, tanks exposed to air, condensation	Cracking due to SCC	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.4.2.2.7)	Not applicable. ONS has no insulated aluminum piping, piping components, or tanks exposed to air or condensation environments in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-106	Copper alloy (>15% Zn or >8% Al) piping, piping components exposed to air, condensation	Cracking due to SCC	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-2191.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-107	Copper alloy (>15% Zn or >8% Al) tanks exposed to air, condensation	Cracking due to SCC	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. ONS has no copper alloy (>15% Zn or >8% Al) tanks exposed to air or condensation environments in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-109	Aluminum piping, piping components, tanks exposed to air, condensation, raw water, waste water	Cracking due to SCC	AMP XI.M32, "One-Time Inspection," AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," or AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.4.2.2.7)	Not applicable. ONS has no aluminum alloy piping, piping components, or tanks exposed to air, condensation, raw water or waste water environments in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-112	Aluminum underground piping, piping components, tanks	Cracking due to SCC	AMP XI.M32, "One-Time Inspection," AMP XI.M41, "Buried and Underground Piping and Tanks," or AMP XI.M42, "Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	Yes (SRP-SLR Section 3.4.2.2.7)	Not applicable. ONS has no aluminum underground piping, piping components or tanks in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-114	Titanium heat exchanger tubes exposed to treated water	Cracking due to SCC, reduction of heat transfer due to fouling	AMP XI.M2, "Water Chemistry," and AMP XI.M32, "One-Time Inspection"	No	Not applicable. ONS has no titanium heat exchanger tubes exposed to treated water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-115	Titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, piping components exposed to treated water	None	None	No	Not applicable. ONS has no titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, or piping components exposed to treated water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-116	Titanium heat exchanger tubes exposed to closed-cycle cooling water	Cracking due to SCC, reduction of heat transfer due to fouling	AMP XI.M21A, "Closed Treated Water Systems"	No	Not applicable. ONS has no titanium heat exchanger tubes exposed to closed-cycle cooling water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-117	Aluminum piping, piping components, tanks exposed to soil, concrete	Loss of material due to pitting, crevice corrosion	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no aluminum piping, piping components, or tanks exposed to soil or concrete in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-119	Insulated aluminum piping, piping components, tanks exposed to air, condensation	Loss of material due to pitting, crevice corrosion	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.4.2.2.9)	Not applicable. ONS has no insulated aluminum piping, piping components, or tanks exposed to air or condensation environments in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-120	Aluminum piping, piping components, tanks exposed to raw water, waste water	Loss of material due to pitting, crevice corrosion	AMP XI.M29, “Outdoor and Large Atmospheric Metallic Storage Tanks,” AMP XI.M32, “One-Time Inspection,” AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” or AMP XI.M42, “Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	Yes (SRP-SLR Section 3.4.2.2.9)	Not applicable. ONS has no aluminum piping, piping components or tanks exposed to raw water or waste water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-122	Elastomer piping, piping components, seals exposed to air	Loss of material due to wear	AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. ONS has no elastomer piping, piping components, or seals exposed to air in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-123	Elastomer piping, piping components, seals exposed to air	Loss of material due to wear	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no elastomer piping, piping components, or seals exposed to air in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-124	PVC piping, piping components, tanks exposed to concrete	None	None	No	Not applicable. ONS has no PVC piping, piping components, or tanks exposed to concrete in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-125	PVC piping, piping components, tanks exposed to soil	Loss of material due to wear	AMP XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. ONS has no PVC piping, piping components, or tanks exposed to soil in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-126	Titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, piping components exposed to closed-cycle cooling water	None	None	No	Not applicable. ONS has no titanium (ASTM Grades 1, 2, 7, 9, 11, or 12) heat exchanger components other than tubes, piping, or piping components exposed to closed-cycle cooling water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-127	Aluminum piping, piping components, tanks exposed to air with borated water leakage	None	None	No	Not applicable. ONS has no aluminum piping, piping components, or tanks exposed to air with borated water leakage in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-128	Copper alloy piping, piping components exposed to concrete	None	None	No	Not applicable. ONS has no copper alloy piping or piping components exposed to concrete in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-129	Copper alloy piping, piping components exposed to soil, underground	Loss of material due to general, pitting, crevice corrosion, MIC (soil only)	AMP XI.M41, “Buried and Underground Piping and Tanks”	No	Not applicable. ONS has no copper alloy piping or piping components exposed to soil or underground in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-130	Titanium piping, piping components, heat exchanger components other than tubes exposed to raw water	Cracking due to SCC, flow blockage due to fouling	AMP XI.M20, "Open-Cycle Cooling Water System," or AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no titanium piping, piping components, or heat exchanger components other than tubes exposed to raw water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-131	Copper alloy (>15% Zn) piping, piping components exposed to air with borated water leakage	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No	Not applicable. ONS has no copper alloy (>15% Zn) piping or piping components exposed to air with borated water leakage in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-132	Stainless steel piping, piping components, tanks exposed to air with borated water leakage	None	None	No	Consistent with NUREG-2191.
3.4.1-133	Aluminum piping, piping components exposed to raw water	Flow blockage due to fouling	AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. ONS has no aluminum piping or piping components exposed to raw water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.

Table 3.4.1 Summary of Aging Management Programs for Steam And Power Conversion System Evaluated in Chapter VIII of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-134	Titanium (ASTM Grades 3, 4, or 5) heat exchanger tubes exposed to raw water	Cracking due to SCC	AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. ONS has no titanium (ASTM Grades 3, 4, or 5) heat exchanger tubes exposed to raw water in the scope of subsequent license renewal in Steam and Power Conversion systems. The associated NUREG-2191 aging items are not used.
3.4.1-135	Polymeric piping, piping components, ducting, ducting components, seals exposed to air, condensation, raw water, raw water (potable), treated water, waste water, underground, concrete, soil	Hardening or loss of strength due to polymeric degradation; loss of material due to peeling, delamination, wear; cracking or blistering due to exposure to ultraviolet light, ozone, radiation, or chemical attack; flow blockage due to fouling	AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” or AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Consistent with NUREG-2191.

Results Tables: Steam and Power Conversion System AMR Results

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
Expansion Joint	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Pressure Boundary	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Flexible Connection	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Flow Element	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Heat Exchanger (condensate booster pump oil cooler) Head	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-454	3.4.1- 106	C
			Closed-Cycle Cooling Water (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.A-473a	3.3.1- 160	A
				Loss of Material	Closed Treated Water System (B2.1.12)	VIII.E.SP-8	3.4.1- 027	C

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (condensate booster pump oil cooler) Head	Structural Integrity	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VIII.F.SP-29	3.4.1- 033	C
Heat Exchanger (condensate cooler) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VIII.E.SP-146	3.4.1- 019	B,1
Heat Exchanger (condensate cooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Heat Exchanger (final sample cooler, hotwell / polishing demin discharge) Shell	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	C

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (final sample cooler, hotwell / polishing demin discharge) Shell	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	C
Heat Exchanger (low pressure feedwater heater) Head	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (low pressure feedwater heater) Head	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Heat Exchanger (low pressure feedwater heater) Shell	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Main Condenser Shell	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Concrete (External)	None	None	VIII.I.SP-154	3.4.1- 051	C
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Main Condenser Tubes	Heat Transfer	Stainless Steel	Raw Water (Internal)	Reduction of Heat Transfer	Open-Cycle Cooling Water System (B2.1.11)	VIII.E.S-28	3.4.1- 022	B
			Treated Water (External)	Reduction of Heat Transfer	One-Time Inspection (B2.1.20)	VIII.E.SP-96	3.4.1- 018	A
					Water Chemistry (B2.1.2)	VIII.E.SP-96	3.4.1- 018	A
	Pressure Boundary	Stainless Steel	Raw Water (Internal)	Loss of Material, Flow Blockage	Open-Cycle Cooling Water System (B2.1.11)	VIII.E.SP-117	3.4.1- 019	B
			Treated Water (External)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-80	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-80	3.4.1- 085	A
				Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	C

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Main Condenser Tubes	Pressure Boundary	Stainless Steel	Treated Water >60°C (>140°F) (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.F.SP-85	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.F.SP-85	3.4.1- 011	A
Main Condenser Tubesheet	Pressure Boundary	Steel with Internal Coating/Lining	Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VIII.E.S-401	3.4.1- 066	B
					Open-Cycle Cooling Water System (B2.1.11)	VIII.E.S-401	3.4.1- 066	E, 2
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VIII.E.S-414	3.4.1- 067	B
					Open-Cycle Cooling Water System (B2.1.11)	VIII.E.S-414	3.4.1- 067	E, 2
			Treated Water (External)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Main Condenser Waterbox	Pressure Boundary	Steel with Internal Coating/Lining	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Raw Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VIII.E.S-401	3.4.1- 066	B
					Open-Cycle Cooling Water System (B2.1.11)	VIII.E.S-401	3.4.1- 066	E, 2
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VIII.E.S-414	3.4.1- 067	B
					Open-Cycle Cooling Water System (B2.1.11)	VIII.E.S-414	3.4.1- 067	E, 2
Orifice	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Flow Restriction	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VIII.E.SP-60	3.4.1- 037	A
			Concrete (External)	None	None	VIII.I.SP-154	3.4.1- 051	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VIII.E.SP-60	3.4.1- 037	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A
				Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,1
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,3
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,3
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,3
						VIII.D1.S-408	3.4.1- 060	A,3

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping and Piping Components	Pressure Boundary	Steel	Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,3
	Structural Integrity	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,3
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,3
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,3
						VIII.D1.S-408	3.4.1- 060	A,3
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,3
Pump Casing (auxiliary boiler feed)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VIII.E.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (condensate booster pump auxiliary lube oil)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VIII.E.SP-91	3.4.1- 040	A
					One-Time Inspection (B2.1.20)	VIII.E.SP-91	3.4.1- 040	A
Pump Casing (condensate booster pump shaft driven main oil)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VIII.E.SP-91	3.4.1- 040	A
					One-Time Inspection (B2.1.20)	VIII.E.SP-91	3.4.1- 040	A
Pump Casing (condensate booster)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (condensate return tank)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VIII.E.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Pump Casing (condensate storage tank)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (feedwater pump seal injection)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VIII.E.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Pump Casing (hotwell sump)	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-6	3.4.1- 054	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	C,1
Pump Casing (polishing demineralizer backwash sump)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (polishing demineralizer backwash sump)	Structural Integrity	Gray Cast Iron	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,1
					Selective Leaching (B2.1.21)	VII.E5.A-724	3.3.1- 072	A
Pump Casing (polishing demineralizer backwash)	Structural Integrity	Ductile Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VIII.E.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Pump Casing (polishing demineralizer holding)	Structural Integrity	Ductile Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (polishing demineralizer holding)	Structural Integrity	Ductile Iron	Treated Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VIII.E.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Pump Casing (polishing demineralizer precoat)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VIII.E.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Pump Casing (sample holding tank)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (sample holding tank)	Structural Integrity	Gray Cast Iron	Treated Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VIII.E.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Pump Discharge Head (hotwell)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Sight Glass	Pressure Boundary	Glass	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-33	3.4.1- 055	A
			Treated Water (Internal)	None	None	VIII.I.SP-35	3.4.1- 055	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Pressure Boundary	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-454	3.4.1- 106	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VIII.E.SP-92	3.4.1- 043	A
					One-Time Inspection (B2.1.20)	VIII.E.SP-92	3.4.1- 043	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	A
					Selective Leaching (B2.1.21)	VIII.E.SP-55	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	A
		Glass	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-33	3.4.1- 055	A
			Lubricating Oil (Internal)	None	None	VIII.I.SP-10	3.4.1- 055	A
			Treated Water (Internal)	None	None	VIII.I.SP-35	3.4.1- 055	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Strainer Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Pressure Boundary	Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Strainer Screen	Filtration	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Tank (condensate storage)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (condensate storage)	Structural Integrity	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Tank (feedwater pump turbine flash)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Tank (oil reservoir on condensate booster pump)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VIII.E.SP-91	3.4.1- 040	C
					One-Time Inspection (B2.1.20)	VIII.E.SP-91	3.4.1- 040	C

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (plant heating condensate return)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Tank (polishing demineralizer)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Tank (powdex and slurry)	Structural Integrity	Steel with Internal Coating/Lining	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Loss of Coating or Lining Integrity	One-Time Inspection (B2.1.20)	VIII.E.S-401	3.4.1- 066	E

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (powdex and slurry)	Structural Integrity	Steel with Internal Coating/Lining	Treated Water (Internal)	Loss of Coating or Lining Integrity	Water Chemistry (B2.1.2)	VIII.E.S-401	3.4.1- 066	E
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Tank (sample holding)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-162	3.4.1- 083	A
					Water Chemistry (B2.1.2)	VIII.E.SP-162	3.4.1- 083	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-97	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-97	3.4.1- 011	A
Tank (upper surge tank dome)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (upper surge tank dome)	Pressure Boundary	Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Tank (upper surge)	Pressure Boundary	Steel with Internal Coating/Lining	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Loss of Coating or Lining Integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VIII.E.S-401	3.4.1- 066	B
				Loss of Material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.27)	VIII.E.S-414	3.4.1- 067	B
Trap Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Trap Body	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Valve Body	Pressure Boundary	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VIII.E.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-6	3.4.1- 054	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	A
		Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VIII.E.SP-27	3.4.1- 033	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Gray Cast Iron	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
			Waste Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.E5.A-785	3.3.1- 193	A

Table 3.4.2-1 Steam and Power Conversion Systems - Condensate System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-281	3.3.1- 091	A,1
		Steel w. Nickel Plating	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
2. Internal surfaces of the main condenser outlet waterboxes and tubesheets will be managed with the Open Cycle Cooling Water AMP.
3. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Accumulator	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
Flexible Connection	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (high pressure feedwater heater) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Heat Exchanger (high pressure feedwater heater) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
		Steel (with Stainless Steel Cladding)	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-80	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-80	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (high pressure feedwater heater) Shell	Structural Integrity	Steel (with Stainless Steel Cladding)	Treated Water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Heat Exchanger (sample cooler) Shell	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VIII.E.S-25	3.4.1- 026	A
			Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VIII.E.SP-54	3.4.1- 023	C
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VIII.E.S-23	3.4.1- 025	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Flow Restriction	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Galvanized Steel	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-13	3.3.1- 116	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,2
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,2
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,2
						VIII.D1.S-408	3.4.1- 060	A,2
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,2

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping and Piping Components	Structural Integrity	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,2
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,2
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,2
						VIII.D1.S-408	3.4.1- 060	A,2
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,2
Pump Casing (feedwater)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Pump Casing (motor driven emergency feedwater)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (motor driven emergency feedwater)	Pressure Boundary	Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Pump Casing (OTSG recirc.)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Pump Casing (OTSG wet layup recirc.)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (OTSG wet layup recirc.)	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Pump Casing (titanium addition)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
Pump Casing (turbine driven emergency feedwater)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (turbine driven emergency feedwater)	Pressure Boundary	Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Sight Glass	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-454	3.4.1- 106	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	A
					Selective Leaching (B2.1.21)	VIII.E.SP-55	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	A
		Glass	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-33	3.4.1- 055	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.SP-67	3.4.1- 055	A
			Treated Water (Internal)	None	None	VIII.I.SP-35	3.4.1- 055	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Stainless Steel	Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Strainer Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Tank (blowdown)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (blowdown)	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Tank (OTSG wet lay-up chemical addition)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-162	3.4.1- 083	A
					Water Chemistry (B2.1.2)	VIII.E.SP-162	3.4.1- 083	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-97	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-97	3.4.1- 011	A
Tank (titanium mixing)	Structural Integrity	Polymeric	Air – Indoor Uncontrolled (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-483a	3.4.1- 135	C

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (titanium mixing)	Structural Integrity	Polymeric	Treated Water (Internal)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VIII.E.S-483b	3.4.1- 135	C,1
Turbine Casing (emergency feedwater pump)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	C
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	C
Turbine Casing (feedwater pump)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	C
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	C
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A

Table 3.4.2-2 Steam and Power Conversion Systems - Feedwater System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
2. The terminology "Piping and Piping Components" represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
Expansion Joint	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Flow Element	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (C heater drain cooler) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Heat Exchanger (C heater drain cooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Heat Exchanger (E heater drain pump oil cooler) Head	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-454	3.4.1- 106	C
			Closed-Cycle Cooling Water (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VII.C2.A-473a	3.3.1- 160	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (E heater drain pump oil cooler) Head	Structural Integrity	Copper Alloy (>15% Zn)	Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VIII.E.SP-8	3.4.1- 027	C
					Selective Leaching (B2.1.21)	VIII.F.SP-29	3.4.1- 033	C
Heat Exchanger (E heater drain pump seal water cooler) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VIII.E.S-23	3.4.1- 025	A
Heat Exchanger (moisture separator drain tank demineralizer) Head	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-80	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-80	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.F.SP-85	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.F.SP-85	3.4.1- 011	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (moisture separator drain tank demineralizer) Shell	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Raw Water (Internal)	Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VIII.E.SP-117	3.4.1- 019	B,1
Heat Exchanger (moisture separator drain tank pump seal water cooler) Shell	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Raw Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VII.C1.A-532	3.3.1- 193	A
				Loss of Material	Open-Cycle Cooling Water System (B2.1.11)	VII.C1.AP-183	3.3.1- 038	B,1
					Selective Leaching (B2.1.21)	VIII.A.SP-28	3.4.1- 033	C
Heat Exchanger (sample cooler) Shell	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	C
				Loss of Material	One-Time Inspection (B2.1.20)	VII.F1.A-770a	3.3.1- 241	A
			Closed-Cycle Cooling Water (Internal)	Loss of Material	Closed Treated Water System (B2.1.12)	VIII.E.S-25	3.4.1- 026	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (sample cooler) Shell	Structural Integrity	Stainless Steel	Closed-Cycle Cooling Water >60°C (>140°F) (Internal)	Cracking	Closed Treated Water System (B2.1.12)	VIII.E.SP-54	3.4.1- 023	C
			Raw Water (Potable) (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-270	3.3.1- 088	C
Orifice	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,2
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,2
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,2
						VIII.D1.S-408	3.4.1- 060	A,2
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,2
	Structural Integrity	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,2
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,2

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping and Piping Components	Structural Integrity	Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,2
						VIII.D1.S-408	3.4.1- 060	A,2
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,2
Pump Casing (E heater drain pump auxiliary oil)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VIII.E.SP-91	3.4.1- 040	A
					One-Time Inspection (B2.1.20)	VIII.E.SP-91	3.4.1- 040	A
Pump Casing (E heater drain shaft driven main oil)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VIII.E.SP-91	3.4.1- 040	A
					One-Time Inspection (B2.1.20)	VIII.E.SP-91	3.4.1- 040	A
Pump Casing (E heater drain)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Casing (E heater drain)	Structural Integrity	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Pump Casing (heater drain sump)	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-6	3.4.1- 054	A
			Waste Water (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.E5.AP-272	3.3.1- 095	C,1
Pump Casing (moisture separator reheater drain)	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VIII.E.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Pump Head (D heater drain)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Pump Head (D heater drain)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Rupture Disk	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Rupture Disk	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Sight Glass	Structural Integrity	Copper Alloy (>15% Zn)	Air – Indoor Uncontrolled (External)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-454	3.4.1- 106	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VIII.E.SP-92	3.4.1- 043	A
					One-Time Inspection (B2.1.20)	VIII.E.SP-92	3.4.1- 043	A
		Glass	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-33	3.4.1- 055	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Glass	Lubricating Oil (Internal)	None	None	VIII.I.SP-10	3.4.1- 055	A
			Treated Water (Internal)	None	None	VIII.I.SP-35	3.4.1- 055	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Strainer Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (C heater flash)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Tank (D heater flash)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Tank (first stage reheater drain)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (first stage reheater drain)	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Tank (moisture separator drain tank demineralizer)	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-162	3.4.1- 083	A
					Water Chemistry (B2.1.2)	VIII.E.SP-162	3.4.1- 083	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-97	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-97	3.4.1- 011	A
Tank (moisture separator reheater drain)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (moisture separator reheater drain)	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Tank (oil reservoir on E heater drain pump)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Lubricating Oil (Internal)	Loss of Material	Lubricating Oil Analysis (B2.1.25)	VIII.E.SP-91	3.4.1- 040	C
					One-Time Inspection (B2.1.20)	VIII.E.SP-91	3.4.1- 040	C
Tank (second stage reheater drain)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Valve Body	Pressure Boundary	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-6	3.4.1- 054	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-6	3.4.1- 054	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.F.SP-101	3.4.1- 016	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Copper Alloy	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.F.SP-101	3.4.1- 016	A
		Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VIII.E.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-3 Steam and Power Conversion Systems - Heater Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A

Plant Specific Notes:

1. Flow blockage due to fouling is not a concern for components that perform a structural integrity function.
2. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.4.2-4 Steam and Power Conversion Systems - High Pressure Turbine Exhaust System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
Flow Element	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-4 Steam and Power Conversion Systems - High Pressure Turbine Exhaust System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Orifice	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-4 Steam and Power Conversion Systems - High Pressure Turbine Exhaust System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-4 Steam and Power Conversion Systems - High Pressure Turbine Exhaust System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,1
	Structural Integrity	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1

Table 3.4.2-4 Steam and Power Conversion Systems - High Pressure Turbine Exhaust System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping and Piping Components	Structural Integrity	Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,1
Valve Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A

Table 3.4.2-4 Steam and Power Conversion Systems - High Pressure Turbine Exhaust System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. The terminology "Piping and Piping Components" represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.4.2-5 Steam and Power Conversion Systems - Heater Vent System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
Expansion Joint	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A

Table 3.4.2-5 Steam and Power Conversion Systems - Heater Vent System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Flexible Connection	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Orifice	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-5 Steam and Power Conversion Systems - Heater Vent System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-5 Steam and Power Conversion Systems - Heater Vent System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VIII.E.SP-60	3.4.1- 037	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-5 Steam and Power Conversion Systems - Heater Vent System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air (Internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VIII.E.SP-60	3.4.1- 037	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1

Table 3.4.2-5 Steam and Power Conversion Systems - Heater Vent System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping and Piping Components	Pressure Boundary	Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,1
	Structural Integrity	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,1
Strainer Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A

Table 3.4.2-5 Steam and Power Conversion Systems - Heater Vent System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (moisture collection)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Trap Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-5 Steam and Power Conversion Systems - Heater Vent System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-5 Steam and Power Conversion Systems - Heater Vent System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A

Plant Specific Notes:

1. The terminology "Piping and Piping Components" represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.4.2-6 Steam and Power Conversion Systems - Low Pressure Turbine Extraction System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
Expansion Joint	Pressure Boundary	Nickel Alloy	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-127a	3.4.1- 003	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A

Table 3.4.2-6 Steam and Power Conversion Systems - Low Pressure Turbine Extraction System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
Flow Element	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-6 Steam and Power Conversion Systems - Low Pressure Turbine Extraction System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Flow Restriction	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A

Table 3.4.2-6 Steam and Power Conversion Systems - Low Pressure Turbine Extraction System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
Piping	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A

Table 3.4.2-6 Steam and Power Conversion Systems - Low Pressure Turbine Extraction System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping and Piping Components	Pressure Boundary	Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,1
	Structural Integrity	Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.D1.S-11	3.4.1- 001	A,1
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A

Table 3.4.2-6 Steam and Power Conversion Systems - Low Pressure Turbine Extraction System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.E.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.E.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.E.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A

Table 3.4.2-6 Steam and Power Conversion Systems - Low Pressure Turbine Extraction System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-73	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.E.SP-73	3.4.1- 014	A

Plant Specific Notes:

1. The terminology "Piping and Piping Components" represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
Desuperheater	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Desuperheater	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Expansion Joint	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Flexible Connection	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-6	3.4.1- 054	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.A.SP-101	3.4.1- 016	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flexible Connection	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Flow Element	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Orifice	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Diesel Exhaust (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.AP-104	3.3.1- 088	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B1.S-08	3.4.1- 001	A,1
	Structural Integrity	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B1.S-08	3.4.1- 001	A,1
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-33	3.4.1- 055	A
			Treated Water (Internal)	None	None	VIII.I.SP-35	3.4.1- 055	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Sight Glass	Structural Integrity	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Strainer Body	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-6	3.4.1- 054	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.A.SP-101	3.4.1- 016	A
Tank (auxiliary steam boiler drum)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Diesel Exhaust (External)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.24)	VII.H2.AP-104	3.3.1- 088	C
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Trap Body	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Gray Cast Iron	Treated Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VIII.A.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.4.2-7 Steam and Power Conversion Systems - Auxiliary Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. The terminology "Piping and Piping Components" represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	High-Strength Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-03	3.4.1- 007	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Structural Integrity	High-Strength Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-03	3.4.1- 007	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air – Outdoor (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air – Outdoor (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Expansion Joint	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Flow Element	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Flow Element	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Heat Exchanger (moisture separator reheater) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Heat Exchanger (moisture separator reheater) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (moisture separator reheater) Shell	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Orifice	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Pressure Boundary	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B1.S-08	3.4.1- 001	A,1
	Structural Integrity	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping and Piping Components	Structural Integrity	Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B1.S-08	3.4.1- 001	A,1
Separator	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Strainer Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Strainer Screen	Filtration	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Tank (main steam bypass drain pumping trap)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tank (main steam bypass drain pumping trap)	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-6	3.4.1- 054	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.A.SP-101	3.4.1- 016	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air – Outdoor (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air – Outdoor (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.4.2-8 Steam and Power Conversion Systems - Main Steam System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.4.2-9 Steam and Power Conversion Systems - Turbine and Auxiliaries System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	High-Strength Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-03	3.4.1- 007	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
	Structural Integrity	High-Strength Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-03	3.4.1- 007	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
Turbine Casing (high pressure)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	C

Table 3.4.2-9 Steam and Power Conversion Systems - Turbine and Auxiliaries System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Turbine Casing (high pressure)	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	C
Turbine Casing (low pressure)	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	C
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	C

Plant Specific Notes:

1. None.

Table 3.4.2-10 Steam and Power Conversion Systems - Plant Heating System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A

Table 3.4.2-10 Steam and Power Conversion Systems - Plant Heating System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (air handler) Tubes	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-6	3.4.1- 054	C
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.A.SP-101	3.4.1- 016	A
Piping	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A

Table 3.4.2-10 Steam and Power Conversion Systems - Plant Heating System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Piping and Piping Components	Pressure Boundary	Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B1.S-08	3.4.1- 001	A,1
	Structural Integrity	Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B1.S-08	3.4.1- 001	A,1
Strainer Body	Structural Integrity	Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.4.2-10 Steam and Power Conversion Systems - Plant Heating System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Structural Integrity	Gray Cast Iron	Treated Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VIII.A.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Trap Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.4.2-10 Steam and Power Conversion Systems - Plant Heating System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Trap Body	Pressure Boundary	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-6	3.4.1- 054	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.A.SP-101	3.4.1- 016	A
		Gray Cast Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Selective Leaching (B2.1.21)	VIII.A.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A

Table 3.4.2-10 Steam and Power Conversion Systems - Plant Heating System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Trap Body	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A

Table 3.4.2-10 Steam and Power Conversion Systems - Plant Heating System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Copper Alloy	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-6	3.4.1- 054	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.SP-101	3.4.1- 016	A
					Water Chemistry (B2.1.2)	VIII.A.SP-101	3.4.1- 016	A
		Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Air with Borated Water Leakage (External)	None	None	VIII.I.S-480	3.4.1- 132	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A

Table 3.4.2-10 Steam and Power Conversion Systems - Plant Heating System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	VIII.H.S-30	3.4.1- 004	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Plant Specific Notes:

1. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.4.2-11 Steam and Power Conversion Systems - Steam Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
Orifice	Flow Restriction	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A

Table 3.4.2-11 Steam and Power Conversion Systems - Steam Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Flow Restriction	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A

Table 3.4.2-11 Steam and Power Conversion Systems - Steam Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Stainless Steel	Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.4.2-11 Steam and Power Conversion Systems - Steam Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B1.S-08	3.4.1- 001	A,1
	Structural Integrity	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1

Table 3.4.2-11 Steam and Power Conversion Systems - Steam Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping and Piping Components	Structural Integrity	Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B1.S-08	3.4.1- 001	A,1
Sight Glass	Structural Integrity	Glass	Air – Indoor Uncontrolled (External)	None	None	VIII.I.SP-33	3.4.1- 055	A
			Treated Water (Internal)	None	None	VIII.I.SP-35	3.4.1- 055	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Strainer Body	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.4.2-11 Steam and Power Conversion Systems - Steam Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Strainer Body	Pressure Boundary	Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Tank (main steam lead drain)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-75	3.4.1- 012	A
					Water Chemistry (B2.1.2)	VIII.E.SP-75	3.4.1- 012	A
Trap Body	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A

Table 3.4.2-11 Steam and Power Conversion Systems - Steam Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Trap Body	Structural Integrity	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.4.2-11 Steam and Power Conversion Systems - Steam Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.4.2-11 Steam and Power Conversion Systems - Steam Drain System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. The terminology "Piping and Piping Components" represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Table 3.4.2-12 Steam and Power Conversion Systems - Steam Seal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	Bolting Integrity (B2.1.9)	VIII.H.S-421	3.4.1- 073	A
				Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Bolting Integrity (B2.1.9)	VIII.H.S-02	3.4.1- 009	A
				Loss of Preload	Bolting Integrity (B2.1.9)	VIII.H.SP-142	3.4.1- 006	A
Damper Housing (steam packing exhauster fan)	Structural Integrity	Ductile Iron	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	C

Table 3.4.2-12 Steam and Power Conversion Systems - Steam Seal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Damper Housing (steam packing exhauster fan)	Structural Integrity	Ductile Iron	Treated Water (Internal)	Loss of Material	Selective Leaching (B2.1.21)	VIII.A.SP-27	3.4.1- 033	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	C
Desuperheater	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A

Table 3.4.2-12 Steam and Power Conversion Systems - Steam Seal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Desuperheater	Structural Integrity	Steel	Treated Water (Internal)	Loss of Material	Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Fan housing (steam packing exhauster)	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	C
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	C
Flexible Connection	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.4.2-12 Steam and Power Conversion Systems - Steam Seal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Heat Exchanger (steam seal condenser) Head	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Heat Exchanger (steam seal condenser) Shell	Structural Integrity	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.E.SP-77	3.4.1- 015	A
					Water Chemistry (B2.1.2)	VIII.E.SP-77	3.4.1- 015	A
Orifice	Flow Restriction	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A

Table 3.4.2-12 Steam and Power Conversion Systems - Steam Seal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Orifice	Flow Restriction	Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Piping	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A

Table 3.4.2-12 Steam and Power Conversion Systems - Steam Seal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Pressure Boundary	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A

Table 3.4.2-12 Steam and Power Conversion Systems - Steam Seal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Piping	Structural Integrity	Steel	Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
Piping and Piping Components	Pressure Boundary	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B1.S-08	3.4.1- 001	A,1
	Structural Integrity	Stainless Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VII.E1.A-57	3.3.1- 002	A,1
		Steel	Treated Water (Internal)	Wall Thinning	Flow-Accelerated Corrosion (B2.1.8)	VIII.D1.S-16	3.4.1- 005	A,1
						VIII.D1.S-408	3.4.1- 060	A,1
			Treated Water >60°C (>140°F) (Internal)	Cumulative Fatigue Damage	TLAA	VIII.B1.S-08	3.4.1- 001	A,1

Table 3.4.2-12 Steam and Power Conversion Systems - Steam Seal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Pressure Boundary	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A
			Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A
	Structural Integrity	Stainless Steel	Air – Indoor Uncontrolled (External)	Cracking	One-Time Inspection (B2.1.20)	VIII.H.S-452b	3.4.1- 104	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.H.S-451b	3.4.1- 103	A

Table 3.4.2-12 Steam and Power Conversion Systems - Steam Seal System - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Valve Body	Structural Integrity	Stainless Steel	Treated Water (Internal)	Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-87	3.4.1- 085	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-87	3.4.1- 085	A
			Treated Water >60°C (>140°F) (Internal)	Cracking	One-Time Inspection (B2.1.20)	VIII.B1.SP-88	3.4.1- 011	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-88	3.4.1- 011	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	External Surfaces Monitoring of Mechanical Components (B2.1.23)	VIII.H.S-29	3.4.1- 034	A
			Treated Water (Internal)	Long-Term Loss of Material	One-Time Inspection (B2.1.20)	VIII.A.S-432	3.4.1- 081	A
				Loss of Material	One-Time Inspection (B2.1.20)	VIII.B1.SP-74	3.4.1- 014	A
					Water Chemistry (B2.1.2)	VIII.B1.SP-74	3.4.1- 014	A

Plant Specific Notes:

1. The terminology “Piping and Piping Components” represents pipes, pipe fittings (reducers, elbows, tees, etc), and in-line piping components (e.g. valves, traps, strainers, orifices, flow elements, etc.) and is used to identify components with the system that are susceptible to wall thinning (due to erosion or flow accelerated corrosion) or cumulative fatigue damage. Component susceptibility to these aging effects is determined by susceptibility analyses, operating experience, or system design.

Tables 3.4.2-1 through 3.4.2-12 Industry Standard Notes:

A. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

B. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-2191 AMP.

C. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

D. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP takes some exceptions to the NUREG-2191 AMP.

E. Consistent with NUREG-2191 item for material, environment, and aging effect, but a different AMP is credited or NUREG-2191 identifies a plant-specific AMP.

F. Material not in NUREG-2191 for this component.

G. Environment not in NUREG-2191 for this component and material.

H. Aging effect not in NUREG-2191 for this component, material, and environment combination.

I. Aging effect in NUREG-2191 for this component, material, and environment combination is not applicable.

J. Neither the component nor the material and environment combination are evaluated in NUREG-2191.

3.5 AGING MANAGEMENT OF CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

3.5.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.4, Containments, Structures, and Component Supports, as being subject to AMR. The systems, or portions of systems, which are addressed in this section are described in the indicated sections.

- Auxiliary Building (Section 2.4.1)
- Reactor Building (Section 2.4.2)
- Turbine Building (Section 2.4.3)
- Keowee Hydro Station (Section 2.4.4)
- Electrical Related Structures (Section 2.4.5)
- Earthen Embankments (Section 2.4.6)
- Yard Structures (Section 2.4.7)
- Bulk Commodities (Section 2.4.8)

3.5.2 RESULTS

The following tables summarize the results of the aging management review for Containments, Structures, and Component Supports:

- Table 3.5.2-1, Containments, Structures, and Component Supports - Auxiliary Building - Aging Management Evaluation
- Table 3.5.2-2, Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation
- Table 3.5.2-3, Containments, Structures, and Component Supports - Turbine Building - Aging Management Evaluation
- Table 3.5.2-4, Containments, Structures, and Component Supports - Keowee Hydro - Aging Management Evaluation
- Table 3.5.2-5, Containments, Structures, and Component Supports - Electrical Related Structures - Aging Management Evaluation
- Table 3.5.2-6, Containments, Structures, and Component Supports - Earthen Embankments - Aging Management Evaluation
- Table 3.5.2-7, Containments, Structures, and Component Supports - Borated Water Storage Tank Superstructure - Aging Management Evaluation
- Table 3.5.2-8, Containments, Structures, and Component Supports - Essential Siphon Vacuum Building - Aging Management Evaluation
- Table 3.5.2-9, Containments, Structures, and Component Supports - Intake Structure - Aging Management Evaluation
- Table 3.5.2-10, Containments, Structures, and Component Supports - Protected Service Water Building - Aging Management Evaluation
- Table 3.5.2-11, Containments, Structures, and Component Supports - Protected Service Water Conduit Duct Banks - Aging Management Evaluation

- Table 3.5.2-12, Containments, Structures, and Component Supports - Standby Shutdown Facility - Aging Management Evaluation
- Table 3.5.2-13, Containments, Structures, and Component Supports - Radwaste Facility - Aging Management Evaluation
- Table 3.5.2-14, Containments, Structures, and Component Supports - Trenches - Aging Management Evaluation
- Table 3.5.2-15, Containments, Structures, and Component Supports - Technical Support Building - Aging Management Evaluation
- Table 3.5.2-16, Containments, Structures, and Component Supports - Elevated Water Storage Tank Structure - Aging Management Evaluation
- Table 3.5.2-17, Containments, Structures, and Component Supports - Microwave House Structure - Aging Management Evaluation
- Table 3.5.2-18, Containments, Structures, and Component Supports - Manholes - Aging Management Evaluation
- Table 3.5.2-19, Containments, Structures, and Component Supports - Condenser Circulating Water Discharge Pipe - Aging Management Evaluation
- Table 3.5.2-20, Containments, Structures, and Component Supports - Health Physics Office Building - Aging Management Evaluation
- Table 3.5.2-21, Containments, Structures, and Component Supports - Administration Building - Aging Management Evaluation
- Table 3.5.2-22, Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation
- Table 3.5.2-23, Containments, Structures, and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

3.5.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.5.2.1.1 Auxiliary Building

Materials

Components in the Auxiliary Building are constructed of the following materials:

- Concrete
- Concrete Block
- Elastomer, Rubber and Other Similar Materials
- Fiber Reinforced Polymer
- Masonry Walls
- Stainless Steel
- Steel

Environments

Components in the Auxiliary Building are exposed to the following environments:

- Air
- Air – Indoor Uncontrolled
- Air – Outdoor
- Air with Borated Water Leakage
- Concrete
- Groundwater/Soil
- Soil
- Treated Borated Water
- Treated Borated Water >60°C (>140°F)
- Water – Flowing

Aging Effects Requiring Management

Components in the Auxiliary Building require aging management to address the following aging effects:

* Cracking
* Cracking or Blistering
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Cumulative Fatigue Damage
* Hardening or Loss of Strength
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Material, Wear, Deformation, Cracking
* Loss of Preload
* Loss of Sealing

Aging Management Programs

The aging effects for components in the Auxiliary Building are managed by the following AMPs:

* Boric Acid Corrosion (B2.1.4)
* Fire Protection (B2.1.15)
* Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)
* Masonry Walls (B2.1.32)
* One-Time Inspection (B2.1.20)
* Structures Monitoring (B2.1.33)
* TLAA
* Water Chemistry (B2.1.2)

3.5.2.1.2 Reactor Building

Materials

Components in the Reactor Building are constructed of the following materials:

* Coatings
* Concrete
* Concrete Block
* Elastomer, Rubber and Other Similar Materials
* Stainless Steel
* Steel
* Steel (with Stainless Steel Cladding)

Environments

Components in the Reactor Building are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air – Outdoor
* Air with Borated Water Leakage
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Reactor Building require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Cumulative Fatigue Damage

* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Coating or Lining Integrity
* Loss of Leak Tightness
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Material, Wear, Deformation, Cracking
* Loss of Preload
* Loss of Prestress
* Loss of Sealing
* Reduction in Foundation Strength, Cracking

Aging Management Programs

The aging effects for components in the Reactor Building are managed by the following AMPs:

* 10 CFR 50, Appendix J (B2.1.31)
* ASME Section XI, Subsection IWE (B2.1.28)
* ASME Section XI, Subsection IWL (B2.1.29)
* Boric Acid Corrosion (B2.1.4)
* Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)
* Masonry Walls (B2.1.32)
* Protective Coating Monitoring and Maintenance (B2.1.35)
* Secondary Shield Wall Tendon Surveillance Program (B4.1)
* Structures Monitoring (B2.1.33)
* TLAA

3.5.2.1.3 Turbine Building

Materials

Components in the Turbine Building are constructed of the following materials:

* Concrete
* Concrete Block
* Elastomer, Rubber and Other Similar Materials
* Masonry Walls
* Steel

Environments

Components in the Turbine Building are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Turbine Building require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Cumulative Fatigue Damage
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength

* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Material, Wear, Deformation, Cracking
* Loss of Preload
* Loss of Sealing

Aging Management Programs

The aging effects for components in the Turbine Building are managed by the following AMPs:

* Fire Protection (B2.1.15)
* Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)
* Masonry Walls (B2.1.32)
* Structures Monitoring (B2.1.33)
* TLAA

3.5.2.1.4 Keowee Hydro Station

Materials

Components in the Keowee Hydro Station are constructed of the following materials:

* Concrete
* Concrete Block
* Elastomer, Rubber and Other Similar Materials
* Stainless Steel
* Steel

Environments

Components in the Keowee Hydro Station are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air – Outdoor
* Concrete
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Keowee Hydro Station require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength

* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Material, Wear, Deformation, Cracking
* Loss of Preload
* Loss of Sealing
* Reduction in Foundation Strength, Cracking

Aging Management Programs

The aging effects for components in the Keowee Hydro Station are managed by the following AMPs:

* FERC Inspections of the Keowee Hydro Station
* Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)
* Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)
* Masonry Walls (B2.1.32)
* Structures Monitoring (B2.1.33)

3.5.2.1.5 Electrical Related Structures

Materials

Components in the Electrical Related Structures are constructed of the following materials:

* Aluminum
* Concrete
* Concrete Block
* Elastomer, Rubber and Other Similar Materials
* Stainless Steel
* Steel

Environments

Components in the Electrical Related Structures are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Electrical Related Structures require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength

* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Preload
* Loss of Sealing

Aging Management Programs

The aging effects for components in the Electrical Related Structures are managed by the following AMPs:

* Masonry Walls (B2.1.32)
* Structures Monitoring (B2.1.33)

3.5.2.1.6 Earthen Embankments

Materials

Components in the Earthen Embankments are constructed of the following materials:

* Various

Environments

Components in the Earthen Embankments are exposed to the following environments:

* Air – Outdoor
* Water – Flowing
* Water – Standing

Aging Effects Requiring Management

Components in the Earthen Embankments require aging management to address the following aging effects:

* Loss of Material, Loss of Form

Aging Management Programs

The aging effects for components in the Earthen Embankments are managed by the following AMPs:

* FERC Inspections of the Keowee Earthen Embankments

3.5.2.1.7 Borated Water Storage Tank Superstructure

Materials

Components in the Borated Water Storage Tank Superstructure are constructed of the following materials:

* Concrete
* Steel

Environments

Components in the Borated Water Storage Tank Superstructure are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Air with Borated Water Leakage
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Borated Water Storage Tank Superstructure require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Preload

* Reduction in Foundation Strength, Cracking

Aging Management Programs

The aging effects for components in the Borated Water Storage Tank Superstructure are managed by the following AMPs:

* Boric Acid Corrosion (B2.1.4)
* Structures Monitoring (B2.1.33)

3.5.2.1.8 Essential Siphon Vacuum Building

Materials

Components in the Essential Siphon Vacuum Building are constructed of the following materials:

* Concrete
* Steel

Environments

Components in the Essential Siphon Vacuum Building are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Essential Siphon Vacuum Building require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Preload

Aging Management Programs

The aging effects for components in the Essential Siphon Vacuum Building are managed by the following AMPs:

* Structures Monitoring (B2.1.33)

3.5.2.1.9 Intake Structure

Materials

Components in the Intake Structure are constructed of the following materials:

* Concrete
* Steel

Environments

Components in the Intake Structure are exposed to the following environments:

* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Intake Structure require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Preload
* Reduction in Foundation Strength, Cracking

Aging Management Programs

The aging effects for components in the Intake Structure are managed by the following AMPs:

* Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)
* Structures Monitoring (B2.1.33)

3.5.2.1.10 Protected Service Water Building

Materials

Components in the Protected Service Water Building are constructed of the following materials:

* Concrete
* Elastomer, Rubber and Other Similar Materials
* Steel

Environments

Components in the Protected Service Water Building are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Protected Service Water Building require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking

* Loss of Material, Wear, Deformation, Cracking
* Loss of Preload
* Loss of Sealing
* Reduction in Foundation Strength, Cracking

Aging Management Programs

The aging effects for components in the Protected Service Water Building are managed by the following AMPs:

* Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)
* Structures Monitoring (B2.1.33)

3.5.2.1.11 Protected Service Water Conduit Duct Banks

Materials

Components in the Protected Service Water Conduit Duct Banks are constructed of the following materials:

* Concrete
* Steel

Environments

Components in the Protected Service Water Conduit Duct Banks are exposed to the following environments:

* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Protected Service Water Conduit Duct Banks require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Preload
* Reduction in Foundation Strength, Cracking

Aging Management Programs

The aging effects for components in the Protected Service Water Conduit Duct Banks are managed by the following AMPs:

* Structures Monitoring (B2.1.33)

3.5.2.1.12 Standby Shutdown Facility

Materials

Components in the Standby Shutdown Facility are constructed of the following materials:

* Concrete
* Elastomer, Rubber and Other Similar Materials
* Steel

Environments

Components in the Standby Shutdown Facility are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Standby Shutdown Facility require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Material, Wear, Deformation, Cracking

* Loss of Preload
* Loss of Sealing
* Reduction in Foundation Strength, Cracking

Aging Management Programs

The aging effects for components in the Standby Shutdown Facility are managed by the following AMPs:

* Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)
* Structures Monitoring (B2.1.33)

3.5.2.1.13 Radwaste Facility

Materials

Components in the Radwaste Facility are constructed of the following materials:

* Concrete
* Concrete Block
* Elastomer, Rubber and Other Similar Materials
* Steel

Environments

Components in the Radwaste Facility are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Radwaste Facility require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Preload

* Loss of Sealing

Aging Management Programs

The aging effects for components in the Radwaste Facility are managed by the following AMPs:

* Masonry Walls (B2.1.32)
* Structures Monitoring (B2.1.33)

3.5.2.1.14 Trenches

Materials

Components in the Trenches are constructed of the following materials:

* Concrete
* Steel

Environments

Components in the Trenches are exposed to the following environments:

* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Trenches require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Preload
* Reduction in Foundation Strength, Cracking

Aging Management Programs

The aging effects for components in the Trenches are managed by the following AMPs:

* Structures Monitoring (B2.1.33)

3.5.2.1.15 Technical Support Building

Materials

Components in the Technical Support Building are constructed of the following materials:

* Concrete
* Steel

Environments

Components in the Technical Support Building are exposed to the following environments:

* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Technical Support Building require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Preload
* Reduction in Foundation Strength, Cracking

Aging Management Programs

The aging effects for components in the Technical Support Building are managed by the following AMPs:

* Structures Monitoring (B2.1.33)

3.5.2.1.16 Elevated Water Storage Tank Structure

Materials

Components in the Elevated Water Storage Tank Structure are constructed of the following materials:

* Steel

Environments

Components in the Elevated Water Storage Tank Structure are exposed to the following environments:

* Air – Outdoor

Aging Effects Requiring Management

Components in the Elevated Water Storage Tank Structure require aging management to address the following aging effects:

* Loss of Material
* Loss of Preload

Aging Management Programs

The aging effects for components in the Elevated Water Storage Tank Structure are managed by the following AMPs:

* Structures Monitoring (B2.1.33)

3.5.2.1.17 Microwave House Structure

Materials

Components in the Microwave House Structure are constructed of the following materials:

* Aluminum
* Concrete
* Elastomer, Rubber and Other Similar Materials
* Steel

Environments

Components in the Microwave House Structure are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Microwave House Structure require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking

* Loss of Preload
* Loss of Sealing

Aging Management Programs

The aging effects for components in the Microwave House Structure are managed by the following AMPs:

* Structures Monitoring (B2.1.33)

3.5.2.1.18 Manholes

Materials

Components in the Manholes are constructed of the following materials:

* Concrete
* Steel

Environments

Components in the Manholes are exposed to the following environments:

* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Manholes require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Preload
* Reduction in Foundation Strength, Cracking

Aging Management Programs

The aging effects for components in the Manholes are managed by the following AMPs:

* Structures Monitoring (B2.1.33)

3.5.2.1.19 Condenser Circulating Water Discharge Pipe

Materials

Components in the Condenser Circulating Water Discharge Pipe are constructed of the following materials:

- Steel

Environments

Components in the Condenser Circulating Water Discharge Pipe are exposed to the following environments:

- Air – Outdoor
- Groundwater/Soil
- Water – Flowing

Aging Effects Requiring Management

Components in the Condenser Circulating Water Discharge Pipe require aging management to address the following aging effects:

- Loss of Material

Aging Management Programs

The aging effects for components in the Condenser Circulating Water Discharge Pipe are managed by the following AMPs:

- Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)

3.5.2.1.20 Health Physics Office Building

Materials

Components in the Health Physics Office Building are constructed of the following materials:

- Aluminum
- Concrete
- Elastomer, Rubber and Other Similar Materials
- Steel

Environments

Components in the Health Physics Office Building are exposed to the following environments:

- Air – Indoor Uncontrolled
- Air – Outdoor
- Groundwater/Soil
- Soil
- Water – Flowing

Aging Effects Requiring Management

Components in the Health Physics Office Building require aging management to address the following aging effects:

- Cracking
- Cracking, Distortion
- Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
- Increase in Porosity and Permeability, Loss of Strength
- Loss of Material
- Loss of Material (Spalling, Scaling), Cracking

* Loss of Preload
* Loss of Sealing

Aging Management Programs

The aging effects for components in the Health Physics Office Building are managed by the following AMPs:

* Structures Monitoring (B2.1.33)

3.5.2.1.21 Administration Building

Materials

Components in the Administration Building are constructed of the following materials:

* Concrete
* Concrete Block

Environments

Components in the Administration Building are exposed to the following environments:

* Air – Indoor Uncontrolled
* Air – Outdoor
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Administration Building require aging management to address the following aging effects:

* Cracking
* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material (Spalling, Scaling), Cracking

Aging Management Programs

The aging effects for components in the Administration Building are managed by the following AMPs:

* Masonry Walls (B2.1.32)
* Structures Monitoring (B2.1.33)

3.5.2.1.22 Component Supports

Materials

Components in the Component Supports are constructed of the following materials:

* Aluminum
* High-Strength Steel
* Lubrite; Fluorogold; Lubrofluor
* PVC
* Stainless Steel
* Steel

Environments

Components in the Component Supports are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air – Outdoor
* Air with Borated Water Leakage
* Concrete
* Treated Borated Water

Aging Effects Requiring Management

Components in the Component Supports require aging management to address the following aging effects:

* Cracking
* Cumulative Fatigue Damage (Only if CLB fatigue analysis exists)
* Loss of Material
* Loss of Mechanical Function
* Loss of Preload

Aging Management Programs

The aging effects for components in the Component Supports are managed by the following AMPs:

* ASME Section XI, Subsection IWF (B2.1.30)
* Boric Acid Corrosion (B2.1.4)
* Structures Monitoring (B2.1.33)
* TLAA
* Water Chemistry (B2.1.2)

3.5.2.1.23 Miscellaneous Structural Commodities

Materials

Components in the Miscellaneous Structural Commodities are constructed of the following materials:

* Cerafiber Bulk, Cerafiber Blanket, Cerafoam, Pyrocrete, Mineral Wool, 3M Putty
* Concrete
* Cork
* Elastomer
* Elastomer, Rubber and Other Similar Materials
* Grout
* Non-Metallic (e.g., Rubber)
* Steel

Environments

Components in the Miscellaneous Structural Commodities are exposed to the following environments:

* Air
* Air – Indoor Uncontrolled
* Air – Outdoor
* Air with Borated Water Leakage
* Groundwater/Soil
* Soil
* Water – Flowing

Aging Effects Requiring Management

Components in the Miscellaneous Structural Commodities require aging management to address the following aging effects:

* Cracking

* Cracking, Distortion
* Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)
* Hardening, loss of strength, or shrinkage
* Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)
* Increase in Porosity and Permeability, Loss of Strength
* Loss of Material
* Loss of Material (Spalling, Scaling), Cracking
* Loss of Material, Cracking/Delamination, Change in Material Properties, Separation
* Loss of Sealing
* Reduction in Concrete Anchor Capacity
* Reduction or Loss of Isolation Function

Aging Management Programs

The aging effects for components in the Miscellaneous Structural Commodities are managed by the following AMPs:

* Boric Acid Corrosion (B2.1.4)
* Fire Protection (B2.1.15)
* Structures Monitoring (B2.1.33)

3.5.2.2 Further Evaluation of Aging Management as Recommended by NUREG-2192

NUREG-2192 provides the bases for identifying those programs that warrant further evaluation by the reviewer in the SLRA. For the containment, structures and component supports those evaluations are addressed in the following sections.

3.5.2.2.1 Pressurized Water Reactor and Boiling Water Reactor Containments

3.5.2.2.1.1 Cracking and Distortion Due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, and Cracking Due to Differential Settlement and Erosion of Porous Concrete Subfoundations

NUREG-2192

Cracking and distortion due to increased stress levels from settlement could occur in PWR and BWR concrete and steel containments. The existing program relies on ASME Code Section XI, Subsection IWL to manage these aging effects. Also, reduction of foundation strength and cracking, due to differential settlement and erosion of porous concrete subfoundations could occur in all types of PWR and BWR containments. The existing program relies on the structures monitoring program to manage these aging effects. However, some plants may rely on a dewatering system to lower the site groundwater level. If the plant's current licensing basis (CLB) credits a dewatering system to control settlement, further evaluation is recommended to verify the continued functionality of the dewatering system during the subsequent period of extended operation.

Evaluation

[3.5.1-001], [3.5.1-002] – ONS does not use a dewatering system to lower site groundwater level in the vicinity of the reactor containments. The *Structures Monitoring* (B2.1.33) program is relied upon to manage reduction of foundation strength and cracking due to differential settlement. ONS did not use high-alumina cement in reactor containments; therefore, erosion of porous concrete subfoundations is not applicable.

3.5.2.2.1.2 Reduction of Strength and Modulus Due to Elevated Temperature

NUREG-2192

Reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR concrete and steel containments. The implementation of 10 CFR 50.55a and ASME Code Section XI, Subsection IWL would not be able to identify the reduction of strength and modulus of concrete due to elevated temperature. Subsection CC-3440 of ASME Code Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. Further evaluation is recommended to determine the need for a plant-specific AMP or plant-specific enhancements to ASME Code Section XI Subsection IWL and/or Structures Monitoring AMPs, to manage these aging effects for portion of the concrete *containment components that exceed specified temperature limits {i.e., general area temperature greater than 66 °C (Celsius) [150 °F (Fahrenheit)] and local area temperature greater than 93 °C (200 °F)}. Higher temperatures may be allowed if tests and/or calculations are provided to evaluate the reduction in strength and modulus of elasticity and these reductions are applied to the design calculations. Acceptance criteria are described in Branch Technical Position (BTP) RLSB (License Renewal and Standardization Branch)-1, "Aging Management Review – Generic, July 2017" (Appendix A.1 of this SRP-SLR.*

Evaluation

[3.5.1-003] – Most open areas in the reactor building have a maximum temperature of 140°F. These values are below the thresholds for localized and general area temperatures specified in this item.

The only high temperature piping penetrating the reactor building shell are the main steam lines and feedwater lines. These main steam penetrations (shown in UFSAR Figure 3-20) are designed with cooling fans and stacks. A review of ONS OE reflects that localized concrete temperatures at the main steam penetrations have marginally exceeded 200°F areas around the penetrations due to limitations of air movement. Exposure to localized, high temperatures can cause immediate cracking of concrete due to restraint of expansion caused by the increased temperatures and is not a potential long term aging effect and mechanism, such as degradation due to radiation exposure where there is a buildup of the aging effect over time before it becomes apparent.

The concrete aggregate used at ONS is a crushed, Gaffney marble obtained from Blacksburg, South Carolina, which produces an excellent, high strength, dense, sound concrete. The design strength was 5000 psi at 28 days for the containment shell. Marble is a calcareous aggregate, which is less susceptible to lower strength (by percentage) at high temperature than siliceous aggregates in concrete as described in NUREG/CR-6900, "The Effect of Elevated Temperature on Concrete Materials and Structures - A Literature Review", in Section 2.2.1. As a result, it is not expected that there would be a reduction in strength for the concrete at ONS due to relatively small, elevated temperatures noted at the main steam line penetrations. Volumetric non-destructive concrete testing was performed to address the exposure to elevated temperature concern, which determined that there was no adverse impact to the concrete strength due to the marginally higher temperatures in these areas. (More detail is provided in OE discussion in the *ASME Section XI – Subsection IWL* (B2.1.29) program)

Therefore, change in material properties due to elevated temperature is not an aging effect and mechanism combination requiring management for ONS concrete structures. For the main steam pipe penetration, the *ASME Section XI – Subsection IWL* (B2.1.29) program is adequate to manage the concrete in these areas. The visual examinations of the containment by the *ASME Section XI – Subsection IWL* (B2.1.29) program are adequate to monitor the exposed concrete surface of the containment structure. Acceptance criteria include the absence of spalling, cracking, and other physical damage, consistent with the parameters identified in American Concrete Institute (ACI) 349.3R-02 for concrete degradation due to thermal exposure. Failure to meet the acceptance criteria is cause for documenting the condition in the ONS corrective action program for further evaluation, which may include other examinations.

3.5.2.2.1.3 Loss of Material Due to General, Pitting and Crevice Corrosion

NUREG-2192

1. *Loss of material due to general, pitting, and crevice corrosion could occur in steel elements of inaccessible areas for all types of PWR and BWR containments. The existing program relies on ASME Code Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J AMPs, to manage this aging effect. Further evaluation is recommended of plant-specific programs to manage this aging effect if corrosion is indicated from the IWE examinations Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

2. *Loss of material due to general, pitting, and crevice corrosion could occur in steel torus shell of Mark I containments. The existing program relies on ASME Code Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J, to manage this aging effect. If corrosion is significant, recoating of the torus is recommended. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

3. *Loss of material due to general, pitting, and crevice corrosion could occur in steel torus ring girders and downcomers of Mark I containments, downcomers of Mark II containments, and interior surface of suppression chamber shell of Mark III containments. The existing program relies on ADME Code Section XI, Subsection IWE to manage this aging effect. Further evaluation is recommended of plant-specific programs to manage this aging effect if corrosion is significant. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

Evaluation

[3.5.1-005], [3.5.1-035] –The *ASME Section XI, Subsection IWE* (B2.1.28) program manages aging of the steel liner of the concrete containment building. The *10 CFR Part 50, Appendix J* (B2.1.31) program manages loss of leak tightness, loss of sealing, and leakage through containment to assure that allowable leakage rate limits specified in the technical specifications are not exceeded. An evaluation of the acceptability of the inaccessible areas is completed whenever conditions are detected in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. OE associated with accessible areas from the *ASME Section XI, Subsection IWE* (B2.1.28) program has identified only minor indications of corrosion, which have been evaluated for continued service or otherwise addressed by the corrective action program.

ONS containment concrete components were designed in accordance with ACI 318-63, “Building Code Requirements for Reinforced Concrete”, and constructed in accordance with ACI 301, using ingredients conforming to ACI and ASTM standards which provide a dense, low permeability concrete to protect against corrosion. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-63. Procedural controls ensured quality throughout the batching, mixing, and placement processes. The *ASME Section XI, Subsection IWL* (B2.1.29) program identifies and manages cracks in the containment concrete that could potentially provide a pathway for water to reach inaccessible portions of the steel containment liner. Therefore, a plant-specific aging management program to manage the effects of general, pitting and crevice corrosion is not required.

[3.5-1-004] Not applicable - BWR only.

[3.5-1-006] Not applicable - BWR only.

[3.5-1-007] Not applicable - BWR only.

3.5.2.2.1.4 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature

NUREG-2192

Loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature for PWR prestressed concrete containments and BWR Mark II prestressed concrete containments is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed in Section 4.5, "Concrete Containment Unbonded Tendon Pre-stress Analysis," and/or Section 4.7 "Other Plant-Specific Time-Limited Aging Analyses," of this SRP-SLR.

Evaluation

[3.5.1-008] – Containment tendon loss of prestress is a TLAA, as defined in 10 CFR 54.3. Loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature for the containment structures is addressed in Section 4.5, "Concrete Containment Tendon Prestress Analysis", and is managed by the *ASME Section XI, Subsection IWL* (B2.1.29) program and the *Concrete Containment Unbonded Tendon Prestress* (B3.4) program. The *Concrete Containment Unbonded Tendon Prestress* (B3.4) program takes exceptions to NUREG-2191. The exceptions are related to the exclusion of certain historical data since the historical results do not truly represent the tendon forces in the group as common tendons and can result in misleading trend lines if included, due to the wire removal and retensioning of the tendons. As the exceptions pertain to historical data, there are no impacts to aging management activities associated with the program for the SPEO.

Loss of prestress of secondary shield wall tendons is managed by the plant specific *Secondary Shield Wall Tendon Surveillance* (B4.1) program. This program performs periodic inspections of tendons and associated hardware, as well as liftoff testing to verify tendon prestress is maintained above established acceptance criteria.

3.5.2.2.1.5 Cumulative Fatigue Damage

NUREG-2192

Evaluations involving time-dependent fatigue, cyclical loading, or cyclical displacement of metal liner, metal plates, suppression pool steel shells (including welded joints) and penetrations (including personnel airlock, equipment hatch, control rod drive (CRD) hatch, penetration sleeves, dissimilar metal welds, and penetration bellows) for all types of PWR and BWR containments and BWR vent header, vent line bellows, and downcomers may be TLAAs as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed in Section 4.6, "Containment Liner Plates, Metal Containments, and Penetrations Fatigue Analysis," and for cases of plant-specific components, in Section 4.7 "Other Plant-Specific Time-Limited Aging Analyses," of this SRP-SLR. For plant-specific cumulative usage factor calculations, the method used is appropriately defined and discussed in the applicable TLAAs.

For the above-stated containment pressure-retaining components (corresponding to Table 3.5-1, Items 027 and 040) subject to cyclic loading for which no CLB fatigue analysis exists at the time of an SLRA submittal, a plant-specific further evaluation may be performed to demonstrate that cracking due to cyclic loading is an aging effect that does not require aging management for the component. As one acceptable approach, the aging effect does not require aging management actions if the further evaluation demonstrates that the six criteria for cyclic loading in paragraph NE-3222.4(d) (NE-3221.5(d) in 1980 and later code editions), "Analysis for Cyclic Operation, Vessels Not Requiring Analysis for Cyclic Service," of ASME Code, Section III, Division 1 (1974 edition or later edition incorporated by reference in 10 CFR 50.55a(a)(i)), that provide for a waiver from detailed fatigue analysis are satisfied for applicable component materials through the end of the subsequent period of extended operation. The option to perform a fatigue waiver analysis to address the aging effect of cracking due to cyclic loading, for specific containment metallic components, is in lieu of performing supplemental surface examinations or performing or crediting an appropriate 10 CFR Part 50, Appendix J, leak-rate test discussed in GALL-SLR Report AMP XI.S1, "ASME Section XI, Subsection IWE."

Evaluation

[3.5.1-009] – Containment Liner, Main Feedwater and Main Steam Containment Penetration/ Fatigue Cracking is a TLAA, as defined in 10 CFR 54.3. The evaluation of this TLAA is addressed in Section 4.6, "Containment Liner Plate, Metal Containments and Penetration Fatigue Analysis".

3.5.2.2.1.6 Cracking Due to Stress Corrosion Cracking

NUREG-2192

Stress corrosion cracking (SCC) of stainless steel (SS) penetration sleeves, penetration bellows, vent line bellows, suppression chamber shell (interior surface), and dissimilar metal welds could *occur in PWR and/or BWR containments. The existing program relies on ASME Code Section XI, Subsection IWE and10 CFR Part 50, Appendix J, to manage this aging effect. Further evaluation, including consideration of SCC susceptibility and applicable operating experience (OE) related to detection, is recommended of additional appropriate examinations/evaluations implemented to detect this aging effect for these SS components and dissimilar metal welds.*

Evaluation

[3.5.1-010] – ONS containment does not have stainless steel penetration sleeves, penetration bellows, vent line bellows, or suppression chamber shell (interior surface) as part of the containment pressure boundary. Stainless steel high energy pipes that penetrate the containment are connected to carbon steel penetration sleeves with dissimilar metal welds. Review of plant OE has not identified stress corrosion cracking associated with these welds. The *ASME Section XI, Subsection IWE* (B2.1.28) program, and *10 CFR Part 50, Appendix J* (B2.1.31) program manages the aging of these dissimilar metal welds.

3.5.2.2.1.7 Loss of Material (Scaling, Spalling) and Cracking Due to Freeze-Thaw

NUREG-2192

Loss of material (scaling, spalling) and cracking due to freeze-thaw could occur in inaccessible areas of PWR and BWR concrete containments. Further evaluation is recommended of this aging effect to determine the need for a plant-specific AMP or plant-specific enhancements to ASME Code Section XI, Subsection IWL, and/or Structures Monitoring AMPs, to manage these aging effects for plants located in moderate to severe weathering conditions. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

Evaluation

[3.5.1-011] – ONS is located in a moderate weathering region, as defined in ASTM C-33. ONS containment concrete components were designed in accordance with ACI 318-63 and constructed in accordance with ACI 301, using ingredients conforming to ACI and ASTM standards which provide a dense, low permeability concrete to protect against corrosion. Procedural controls ensured quality throughout the batching, mixing, and placement processes. Review of plant OE has not identified aging effects related to freeze-thaw in accessible areas and the *Structures Monitoring* (B2.1.33) program and the *ASME Section XI, Subsection IWL* (B2.1.29) program confirm the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access. Therefore, a plant-specific AMP or plant-specific enhancements to the *Structures Monitoring* (B2.1.33) program and the *ASME Section XI, Subsection IWL* (B2.1.29) program for inaccessible areas to manage the aging effects of loss of material (scaling, spalling) and cracking due to freeze-thaw are not required.

3.5.2.2.1.8 Cracking Due to Expansion From Reaction with Aggregates

NUREG-2192

Cracking due to expansion from reaction with aggregates could occur in inaccessible areas of concrete elements of PWR and BWR concrete and steel containments. The GALL-SLR Report recommends further evaluation to determine the need for a plant-specific AMP or plant-specific enhancements to ASME Code Section XI, Subsection IWL, and/or Structures Monitoring AMPs to manage this aging effect. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

Evaluation

[3.5.1-012] – Inspection for Alkali-Silica Reaction has been incorporated into the *ASME Section XI, Subsection IWL* (B2.1.29) program. Augmented inspections for the *ASME Section XI, Subsection IWL* (B2.1.29) program include examination for pattern cracking with darkened crack edges, water ingress, and misalignment inspections. Alkali-Silica Reaction inspection results are evaluated by the responsible engineer each inspection cycle to identify changes that could be indicative of Alkali-Silica Reaction development. Such indications will be entered into the corrective action program. Review of plant OE has not identified evidence of Alkali-Silica Reaction in ONS containments.

3.5.2.2.1.9 Increase in Porosity and Permeability Due to Leaching of Calcium Hydroxide and Carbonation

NUREG-2192

Increase in porosity and permeability due to leaching of calcium hydroxide and carbonation could occur in inaccessible areas of concrete elements of PWR and BWR concrete and steel containments. Further evaluation is recommended to determine the need for a plant-specific AMP or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, to manage these aging effects if leaching is observed in accessible areas that impact intended functions. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

Evaluation

[3.5.1-014] – Reinforced concrete structures at ONS were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Procedural controls ensured quality throughout the batching, mixing, and placement processes. The *ASME Section XI, Subsection IWL* (B2.1.29) program and the *Structures Monitoring* (B2.1.33) program identify and manage cracks in the containment concrete. Review of plant OE has not identified aging effects related to increase in porosity and permeability due to leaching of calcium hydroxide and carbonation. The *Structures Monitoring* (B2.1.33) program and the *ASME Section XI, Subsection IWL* (B2.1.29) program confirm the absence of aging effects related to leaching of calcium hydroxide and carbonation. Therefore, a plant-specific AMP or plant-specific enhancements to the *Structures Monitoring* (B2.1.33) program and the *ASME Section XI, Subsection IWL* (B2.1.29) program for inaccessible areas to manage the aging effects of increase in porosity and permeability due to leaching of calcium hydroxide and carbonation are not required.

3.5.2.2.2 Safety Related and Other Structures and Component Supports

3.5.2.2.2.1 Aging Management of Inaccessible Areas

NUREG-2192

1. *Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Groups 1–3, 5 and 7–9 structures. Further evaluation is recommended of inaccessible areas of these Groups of structures for plants located in moderate to severe weathering conditions to determine the need for a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP, to manage these aging effects. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

2. *Cracking due to expansion and reaction with aggregates could occur in inaccessible concrete areas for Groups 1–5 and 7–9 structures. Further evaluation is recommended of inaccessible areas of these Groups of structures to determine the need for a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP, to manage this aging effect. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

3. *Cracking and distortion due to increased stress levels from settlement could occur in below-grade inaccessible concrete areas of structures for all Groups, and reduction in foundation strength, and cracking due to differential settlement and erosion of porous concrete subfoundations could occur in below-grade inaccessible concrete areas of Groups 1–3, 5–9 structures. The existing program relies on structure monitoring programs to manage these aging effects. Some plants may rely on a dewatering system to lower the site groundwater level. If the plant's CLB credits a dewatering system, verification is recommended of the continued functionality of the dewatering system during the subsequent period of extended operation. No further evaluation is recommended if this activity is included in the scope of the applicant's structures monitoring program.*

4. *Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation could occur in below-grade inaccessible concrete areas of Groups 1–5 and 7–9 structures. Further evaluation is recommended to determine the need for a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP, to manage these aging effects if leaching is observed in accessible areas that*

impact intended functions. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

Evaluation

[3.5.1-042] – ONS is located in a moderate weathering region, as defined in ASTM C-33. Reinforced concrete structures at ONS were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Procedural controls ensured quality throughout the batching, mixing, and placement processes. Review of plant OE has not identified aging effects related to freeze-thaw in accessible areas and the *Structures Monitoring* (B2.1.33) program confirms the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access. Therefore, a plant-specific AMP or plant-specific enhancements to the *Structures Monitoring* (B2.1.33) program for inaccessible areas to manage the aging effects of loss of material (scaling, spalling) and cracking due to freeze-thaw are not required

[3.5.1-043] – Inspection for Alkali-Silica Reaction has been incorporated into the *Structures Monitoring* (B2.1.33) program. Structures Monitoring Inspections include examination for pattern cracking with darkened crack edges, water ingress, and misalignment inspections. Alkali-Silica Reaction inspection results are evaluated by the responsible engineer to identify changes that could be indicative of Alkali-Silica Reaction development. Such indications will be entered into the corrective action program. Review of plant OE has not identified evidence of Alkali-Silica Reaction in below-grade inaccessible concrete areas of ONS groups 1–5 and 7–9 structures.

[3.5.1-044], [3.5.1-046] – ONS does not rely on a dewatering system to lower site groundwater level. The *Structures Monitoring* (B2.1.33) program is relied upon to detect cracking and distortion due to increased stress levels from settlement, as well as reduction of foundation strength and cracking, due to differential settlement. FERC Inspections of the Keowee hydro station have been substituted and will be used to manage cracking and distortion due to increased stress levels from settlement for the Keowee hydro station concrete exposed to soil environments for the penstock, power tunnels, spillway and intake. Oconee did not use high-alumina cement in reactor containments; therefore, erosion of porous concrete subfoundations is not applicable.

[3.5.1-047] – Reinforced concrete structures at ONS were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Procedural controls ensured quality throughout the batching, mixing, and placement processes. Review of plant OE has not identified aging effects related to increase in porosity and permeability due to leaching of calcium hydroxide and carbonation. The *Structures Monitoring* (B2.1.33) program confirms the absence of aging effects related to leaching of calcium hydroxide and carbonation. Therefore, a plant-specific AMP or plant-specific enhancements to the *Structures Monitoring* (B2.1.33) program for inaccessible areas to manage the aging effects of increase in porosity and permeability due to leaching of calcium hydroxide and carbonation are not required in below-grade inaccessible concrete areas of ONS groups 1–5 and 7–9 structures.

3.5.2.2.2.2 Reduction of Strength and Modulus Due to Elevated Temperature

NUREG-2192

Reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR Group 1–5 concrete structures. For any concrete elements that exceed specified temperature limits, further evaluations are recommended. Appendix A of American Concrete Institute (ACI) 349-85, "Code Requirements for Nuclear Safety-Related Concrete Structures," specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 66 °C (150 °F) except for local areas, which are allowed to have increased temperatures not to exceed 93 °C (200°F). Further evaluation is recommended to determine the need for a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP, to manage these aging effects if any portion of the safety-related and other concrete structures exceeds specified temperature limits [i.e., general area temperature greater than 66 °C (150 °F) and local area temperature greater than 93 °C (200 °F)]. Higher temperatures may be allowed if tests and/or calculations are provided to evaluate the reduction in strength and modulus of elasticity and these reductions are applied to the design calculations. The acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

Evaluation

[3.5.1-048] – UFSAR Section 9.1.3 states that the ONS spent fuel pool cooling systems are designed to maintain the pool bulk water temperature below 150 for normal heat loads. The spent fuel pools have an actual operating limit of 205°F (abnormal case). Analyses have been performed to ensure that seismic and structural integrity of the pool liner, supporting concrete, and fuel racks are not compromised at this temperature limit.

General area air temperature in other Class I Structures is maintained at values less than where degradation would be expected to occur. Review of operating experience has identified no issues related to elevated temperatures affecting concrete structures. Additionally, analysis performed to determine the maximum concrete temperature of the primary shield wall illustrates that the concrete will not exceed 200 °F for local loads. Therefore, a plant-specific aging management program to manage the effects of reduction of strength and modulus due to elevated temperature is not required.

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

NUREG-2192

Further evaluation is recommended for inaccessible areas of certain Group 6 structure/aging effect combinations as identified below, whether or not they are covered by inspections in accordance with the GALL-SLR Report, AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," or Federal Energy Regulatory Commission (FERC)/U.S. Army Corp of Engineers dam inspection and maintenance procedures.

1. *Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Group 6 structures. Further evaluation is recommended of this aging effect to determine the need for a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP, to manage these aging effects for inaccessible areas for plants located in moderate to severe weathering conditions. Acceptance criteria are described in BTP RLSB-1 (Appendix A1 of this SRP-SLR).*

2. *Cracking due to expansion and reaction with aggregates could occur in inaccessible concrete areas of Group 6 structures. Further evaluation is recommended to determine the need for a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP, to manage this aging effect. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

3. *Increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation could occur in inaccessible areas of concrete elements of Group 6 structures. Further evaluation is recommended to determine the need for a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP, to manage these aging effects if leaching is observed in accessible areas that impact intended functions. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

<u>Evaluation</u>

[3.5.1-049] – ONS is located in a moderate weathering region, as defined in ASTM C-33. Reinforced concrete structures at ONS were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Procedural controls ensured quality throughout the batching, mixing, and placement processes. Review of plant OE has not identified any aging effects related to freeze-thaw in accessible areas. The *Structures Monitoring* (B2.1.33) program confirms the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access. Therefore, a plant-specific AMP or plant-specific enhancements to the *Structures Monitoring* (B2.1.33) program for inaccessible areas to manage the aging effects of loss of material (scaling, spalling) and cracking due to freeze-thaw are not required.

[3.5.1-050] – Plant operating experience has not identified any indications of Alkali-Silica Reaction for the concrete structures at ONS, except for at the Keowee dam spillway. During 2001 and 2003, gate binding problems were experienced at Gates 4 and 1, respectively. The binding was resolved by recessing the guide plates into the piers to increase the clearances. A threshold of 0.75 inches of additional spillway end wall movement was established as part of the Potential Failure Modes Analysis, which is performed during each FERC Part 12D inspection. In 2008, the movement threshold on the spillway abutment walls was exceeded. The concrete was then evaluated through drilling, sampling, borehole imaging, compression testing, petrographic testing, in-situ stress testing, biaxial modulus testing, and stress calculation. The investigations found that no significant deterioration of the spillway concrete had occurred. As there are no reliable methods to stop or retard the Alkali-Silica Reaction process, the most viable solution was determined to be monitor and adjust the gates as needed to maintain sufficient operating clearance.

The information obtained from the Alkali-Silica Reaction evaluations has provided anticipated rates of progression that is used in conjunction with visual inspections to guide the implementation schedule for the plant modification of the gates. This is surveyed and monitored by the Dam Safety Surveillance and Monitoring Plan (DSSMP), which is utilized to meet the guidelines of FERC and is evaluated as part of the FERC Part 12D inspection. As stated in NUREG-2191 XI.S7, for dam inspection and maintenance, programs under the regulatory jurisdiction of the FERC or the U.S. Army Corps of Engineers (USACE), continued through the SPEO, are adequate for the purpose of aging management.

Inspection for Alkali-Silica Reaction has been incorporated into the *Structures Monitoring* (B2.1.33) program. Changes that could be indicative of Alkali-Silica Reaction development will be entered into the corrective action program. Therefore, a plant-specific aging management for inaccessible areas is not required to manage cracking due to expansion from reaction with aggregates.

ONS Alkali-Silica Reaction operating experience is limited to the Keowee dam spillway and is not indicative of the potential for Alkali-Silica Reaction in other concrete structures at ONS. Therefore, a plant-specific AMP or plant-specific enhancements to *Structures Monitoring* (B2.1.33) AMP for inaccessible areas are not required to manage cracking due to expansion from reaction with aggregates.

[3.5.1-051] – Reinforced concrete structures at ONS were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Procedural controls ensured quality throughout the batching, mixing, and placement processes. The *Structures Monitoring* (B2.1.33) program, which includes Group 6 structures, identifies and manages cracks in the concrete structures. Review of plant OE has not identified aging effects related to increase in porosity and permeability due to leaching of calcium hydroxide and carbonation. Therefore, a plant-specific AMP or plant-specific enhancements to the *Structures Monitoring* (B2.1.33) program for inaccessible areas to manage the aging effects of increase in porosity and permeability due to leaching of calcium hydroxide and carbonation are not required in Group 6 structures.

3.5.2.2.2.4 Cracking Due to Stress Corrosion Cracking, and Loss of Material Due to Pitting and Crevice Corrosion

NUREG-2192

Cracking due to SSC and loss of material due to pitting and crevice corrosion could occur in (a) Group 7 and 8 SS tank liners exposed to standing water; and (b) SS and aluminum alloy support members; welds; bolted connections; or support anchorage to building structure exposed to air or condensation (see SRP-SLR Sections 3.2.2.2.2, 3.2.2.2.4, 3.2.2.2.8, and 3.2.2.2.10 for background information).

For Group 7 and 8 SS tank liners exposed to standing water, further evaluation is recommended of plant-specific programs to manage these aging effects. The acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

For SS and aluminum alloy support members; welds; bolted connections; support anchorage to building structure exposed to air or condensation, the plant-specific OE and condition of the SS and aluminum alloy components are evaluated to determine if the plant-specific air or condensation environments are aggressive enough to result in loss of material or cracking after prolonged exposure. The aging effects of loss of material and cracking in SS and aluminum alloy components is not applicable and does not require management if (a) the plant-specific OE does not reveal a history of pitting or crevice corrosion or cracking and (b) a one-time inspection demonstrates that the aging effects are not occurring or that an aging effect is occurring so slowly that it will not affect the intended function of the components during the subsequent period of extended operation. The applicant documents the results of the plant-specific OE review in the SLRA. Visual inspections conducted in accordance with GALL-SLR Report AMP XI.M32, "One-Time Inspection," are an acceptable method to demonstrate that the aging effects are not occurring at a rate that affects the intended function of the components. One-time inspections are conducted between the 50th and 60th year of operation, as recommended by the "detection of aging effects" program element in AMP XI.M32. If loss of material or cracking has occurred and is sufficient to potentially affect the intended function of SS or aluminum alloy support members; welds; bolted connections; or support anchorage to building structure, either: (a) enhancing the applicable AMP (i.e., GALL-SLR Report AMP XI.S3, "ASME Section XI, Subsection IWF," or AMP XI.S6, "Structures Monitoring"); (b) conducting a representative sample inspection consistent with GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components;" or (c) developing a plant-specific AMP are acceptable programs to manage loss of material or cracking (as applicable). Tempers have been specifically developed to improve the SCC resistance for some aluminum alloys. Aluminum alloy and temper combinations which are not susceptible to SCC when used in structural support applications include 1xxx series, 3xxx series, 6061-T6x, and 5454-x. For these alloys and tempers, the susceptibility of cracking due to SCC is not applicable. If these alloys or tempers have been used, the SLRA states the specific alloy or temper used for the applicable in-scope components.

Evaluation

[3.5.1-052] – There are no stainless steel tank liners in the scope of SLR for ONS.

[3.5.1-099], [3.5.1-100] – A review of ONS OE has not identified pitting or crevice corrosion or cracking for stainless steel or aluminum structural components exposed to air or condensation. The *ASME Section XI, Subsection IWF* (B2.1.30) program or *Structures Monitoring* (B2.1.33) program will manage the aging of stainless steel and aluminum component supports to ensure that these components continue to perform their intended functions during the SPEO, except as follows: (1) Stainless steel components of the trash rack filter at the intake structure will be managed by the *Inspection of Water-Control Structures Associated with Nuclear Power Plants* (B2.1.34) program. (2) Stainless steel structural elements and bolting of the penstock, power tunnels, and spillway will be managed by the FERC Inspections of the Keowee hydro station.

3.5.2.2.2.5 Cumulative Fatigue Damage

NUREG-2192

Evaluations involving time-dependent fatigue, cyclical loading, or cyclical displacement of component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports are TLAAs as defined in 10 CFR 54.3 only if a CLB fatigue analysis exists. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed in Section 4.3, "Metal Fatigue Analysis," and/or Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses," of this SRP-SLR. For plant-specific cumulative usage factor calculations, the method used is appropriately defined and discussed in the applicable TLAAs.

Evaluation

[3.5.1-053] – The evaluation of fatigue for component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports are TLAAs as defined in 10 CFR 54.3, and is addressed in SLRA Section 4.3, "Metal Fatigue".

3.5.2.2.2.6 Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation

NUREG-2192

Reduction of strength, loss of mechanical properties, and cracking due to irradiation could occur in PWR and BWR Group 4 concrete structures that are exposed to high levels of neutron and gamma radiation. These structures include the reactor (primary/biological) shield wall, the sacrificial shield wall, and the reactor vessel support/pedestal structure. Data related to the effects and significance of neutron and gamma radiation on concrete mechanical and physical properties is limited, especially for conditions (dose, temperature, etc.) representative of light-water reactor (LWR) plants. However, based on literature review of existing research, radiation fluence limits of 1×10^{19} neutrons/cm^2 neutron radiation and 1×10^8 Gy (1×10^{10} rad) gamma dose are considered conservative radiation exposure levels beyond which concrete material properties may begin to degrade markedly.

Further evaluation is recommended to determine the need for a plant-specific AMP or plant-specific enhancements to selected existing AMPs to manage the aging effects of irradiation if the estimated (calculated) fluence levels or irradiation dose received by any portion of the concrete from neutron (fluence cutoff energy E > 0.1 MeV) or gamma radiation exceeds the respective threshold level during the subsequent period of extended operation that could affect intended functions. Higher fluence or dose levels may be allowed in the concrete if tests and/or calculations are provided to evaluate the reduction in strength and/or loss of mechanical properties of concrete from those fluence levels, at or above the operating temperature experienced by the concrete, and the effects are applied to the design calculations. Supporting calculations/analyses, test data, and other technical basis are provided to estimate and evaluate *fluence levels and the plant-specific program. The acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

Evaluation

[3.5.1-097] – The following information describes the general configuration of the steel reactor vessel support skirt and support embedment and the adjacent reinforced concrete primary shield wall and reactor vessel pedestal, the analytical methods used to determine the neutron and gamma radiation environment, and the analytical results of the radiation impact to the reactor vessel steel supports and concrete structures.

Reactor Vessel Support Skirt and Reactor Cavity Configuration

The reactor vessel is located within the reactor cavity (also known as the primary shield wall). The reactor vessel head and control rod drives extend into the fuel transfer canal. Openings are provided in the lower part of the shield wall to provide vent area. Piping carrying high pressure injection water are routed outside the reactor cavity and two steam generator cavities entering only when connecting to the loop. The steam generator cavities (or secondary shield walls) house the steam generators, coolant pumps, associated piping and the pressurizer.

The reactor cavity serves as a biological shield wall. The reactor cavity is also designed to contain core flooding water up to the level of the reactor nozzle. The reactor consists of reinforced concrete surrounding the reactor vessel and extends upward from the reactor building floor to form the walls of the fuel transfer canal. The thickness is 5 ft. up to the height of the reactor vessel flange, where the thickness is reduced to 4.5 ft.

The reactor cavity does not provide a support function for the reactor coolant system. The reactor coolant piping is self-supporting with respect to deadweight, seismic, and thermal loading. The reactor coolant pumps are partially supported by rod hangers which are designed to support the dead weight of the pump motor, with the remainder of the dead weight of the pump being supported by the piping. A reactor vessel support skirt provides support for the reactor vessel during seismic events or to transfer lateral and vertical loads to the reinforced reactor vessel foundation. The reactor vessel support skirt is welded to the reactor vessel transition forging (i.e. dutchman). The support skirt flange is bolted to reactor vessel support embedment which transfers loads to the pedestal concrete. The transition forging and anchoring bolts are low alloy steel and the reactor vessel skirt is carbon steel.

Analytical Methodology

To determine the potential impact of neutron and gamma radiation to the reactor cavity wall, Duke Energy utilized an analytical model developed by Framatome to estimate fluence and gamma dose analysis at the inside surface of the reactor cavity wall, reactor vessel support skirt, and reactor vessel support embedment to support operation to 80 years. The methodology used is consistent with BAW-2241PA using DORT 2-D methodology for the beltline region.

The analytical model utilized a bounding source term to determine neutron flux and fluence, as well as the gamma dose at the inside surface of the reactor cavity. The bounding source term is based a conservative core design bounding all potential future fuel cycle design. DORT is used to determine the neutron flux and fluence in the air cavity above the reactor vessel skirt support weld and reactor vessel support embedment to determine a bounding fluence value for these locations. DORT is also used to determine the peak neutron fluence and gamma dose in the concrete bio-shield. Since the Oconee DORT model does not include the reactor vessel skirt weld and support embedment, an extrapolation was performed using a curve fit to flux profiles at the outer surface of the reactor vessel to obtain results for these locations. The extrapolations were terminated below the DORT model near the top of the reactor vessel skirt weld.

The neutron and gamma fluxes were calculated at the cavity locations of interest by generating by synthesis of DORT model calculations to provide neutron and gamma flux values at the chosen locations for fluence and dose projections to 72 EFPY. A bounding estimated cumulative fluence through Cycle 24 for all three Oconee units was added to the fluence determined by DORT from the beginning of Cycle 25 to 72 EFPY.

Reactor Cavity Wall Concrete Evaluation

Neutron fluence and gamma dose at the inside surface of the reactor cavity wall were obtained by extending the DORT model into the wall at the height where the maximum neutron flux (E > 0.1 MeV) and gamma heating occurs. The inside surface of reactor vessel cavity is 353 cm from the core's centerline. The maximum value is axially adjacent to the core region.

- The maximum neutron fluence at 72 EFPY for the inside surface of the reactor cavity walls is 9.36E18 n/cm2 (E > 0.1 MeV). This value is below the SRP-SLR threshold limit of 1E19 n/cm2 for fast neutron fluence (E > 0.1 MeV). The location of the maximum neutron fluence is 3 cm above core midplane.
- The maximum gamma dose at 72 EFPY for the inside surface of the reactor cavity wall is 5.87E+09 rads. This value is below the SRP-SLR threshold limit of 1E10 rads gamma dose. The location of maximum gamma heating is 3 cm below the core midplane.

Reactor Vessel Embedment Pedestal Concrete Evaluation

The bottom of the DORT model extends out to and including the reactor vessel transition forging to lower shell forging weld. However, the reactor vessel support embedment, which is more than 5 feet below reactor vessel transition forging to lower shell forging weld, is not part of the DORT model. Thus, to estimate neutron fluence and gamma dose at the reactor vessel support embedment, flux and gamma heating rate profiles were generated on the outer reactor vessel surface in the air cavity region and extrapolated below the DORT model out to the reactor vessel support skirt weld to ensure conservatism in the analyses of the pedestal concrete due to the change in the shape of the cavity at the reactor vessel support embedment.

- The maximum neutron fluence at 72 EFPY for the reactor vessel support skirt weld is 1.63E+18 n/cm2 n/cm2 (E > 0.1 MeV). This value is below the SRP-SLR threshold limit of 1E19 n/cm2 for fast neutron fluence (E > 0.1 MeV). The support skirt weld is located 71 cm above the reactor vessel support embedment and provides a bounding fluence projection for the embedment pedestal concrete.

- The maximum gamma dose for the reactor vessel support skirt weld is 1.75E09 rads. This value is below the SRP-SLR threshold limit of 1E10 rads gamma dose and provides a bounding gamma dose projection for the embedment pedestal concrete.

Reactor Vessel Support Steel Evaluation

The reactor vessel support assembly and embedment consist of a support skirt, a support flange, anchor bolts and associated washers and hex nuts, sole plate, vertical bearing plate and associated nelson studs, grout, and reinforced concrete pedestal that contains the embedded anchor bolts. The reactor vessel support assembly is defined as the reactor vessel support skirt and the reactor vessel support flange, which were attached to the reactor vessel during fabrication of the reactor vessel. The reactor vessel embedment includes the anchor bolts and associated washers and hex nuts, sole plate, vertical bearing plate and associated nelson studs, grout, and reinforced concrete pedestal that contain the embedded anchor bolts.

Based on configuration of the reactor vessel support assembly and embedment detail, the following items were determined to directly support the reactor vessel support intended function (i.e., provide structural support for the reactor vessel):

- RPV support skirt (SA-516 Grade 70)
- RPV support flange (SA-515 Grade 70)
- Anchor bolts (A490)
- Anchor bolt jamb nuts, hex nuts, and washers

These structural steel components performing an intended function were subject to evaluation for susceptibility to irradiation embrittlement using the process documented in NUREG-1509. Details of that evaluation may be found in Framatome document ANP-3898P.

The evaluation of reactor vessel support steel determined that the reactor vessel support flange (all three ONS units) and the ONS Unit 1 and Unit 2 reactor vessel support flange welds connecting the 90 degree segments together to form a circular support plate are potentially susceptible to reduction of fracture toughness by irradiation embrittlement at 72 EFPY of operation. All remaining reactor vessel support assembly and embedment items that support the vessel support intended function were determined to not be susceptible to irradiation embrittlement. The evaluation concluded that the potential for irradiation embrittlement of the support flange is acceptable considering: (1) configuration of the reactor vessel support skirt welded to the flange plate and the numerous bolts connecting the flange plate to the concrete, and (2) stresses in the flange plate are bounded by the stresses in the RPV support skirt, which is considered the most vulnerable part of the fracture-critical member. Since the RPV support skirt is the critical location of the reactor vessel support assembly and is not susceptible to irradiation embrittlement based on the NDT evaluation reported above, the reactor vessel support intended function will be maintained consistent with the CLB during the SPEO when considering damage due to irradiation.

3.5.2.2.3 Quality Assurance for Aging Management of Non-Safety Related Components

NUREG-2192

Acceptance criteria are described in BTP IQMB-1 (Appendix A.2 of this SRP-SLR).

Evaluation

Quality Assurance provisions applicable to SLR are discussed in Appendix B1.3, Quality Assurance Program and Administrative Controls.

3.5.2.2.4 Ongoing Review of Operating Experience

NUREG-2192

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

Evaluation

The operating experience process and acceptance criteria are described in Appendix B1.4, Operating Experience.

Results Tables: Containments, Structures, And Component Supports

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-001	Concrete: dome; wall; basemat; ring girders; buttresses, concrete elements, all	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring"	Yes (SRP-SLR Section 3.5.2.2.1.1)	Consistent with NUREG-2191. The *Structures Monitoring* (B2.1.33) program is relied upon to detect cracking and distortion due to increased stress levels from settlement. See further evaluation in Section 3.5.2.2.1.1.
3.5.1-002	Concrete: foundation; subfoundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes (SRP-SLR Section 3.5.2.2.1.1)	Consistent with NUREG-2191. See further evaluation in Section 3.5.2.2.1.1.
3.5.1-003	Concrete: dome; wall; basemat; ring girders; buttresses, concrete: containment; wall; basemat, concrete: basemat, concrete fill-in annulus	Reduction of strength and modulus of elasticity due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program, or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring" enhanced as necessary	Yes (SRP-SLR Section 3.5.2.2.1.2)	Not applicable. The associated NUREG-2191 aging items are not used. See further evaluation in Section 3.5.2.2.1.2.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-004	Steel elements (inaccessible areas): drywell shell; drywell head	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, “ASME Section XI, Subsection IWE,” and AMP XI.S4, “10 CFR Part 50, Appendix J”	Yes (SRP-SLR Section 3.5.2.2.1.3.1)	Not applicable. BWR only.
3.5.1-005	Steel elements (inaccessible areas): liner; liner anchors; integral attachments, steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, “ASME Section XI, Subsection IWE,” and AMP XI.S4, “10 CFR Part 50, Appendix J”	Yes (SRP-SLR Section 3.5.2.2.1.3.1)	Consistent with NUREG-2191. See further evaluation in Section 3.5.2.2.1.3.
3.5.1-006	Steel elements: torus shell	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, “ASME Section XI, Subsection IWE,” and AMP XI.S4, “10 CFR Part 50, Appendix J”	Yes (SRP-SLR Section 3.5.2.2.1.3.2)	Not applicable. BWR only.
3.5.1-007	Steel elements: torus ring girders; downcomers;, Steel elements: suppression chamber shell (interior surface)	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, “ASME Section XI, Subsection IWE”	Yes (SRP-SLR Section 3.5.2.2.1.3.3)	Not applicable. BWR only.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-008	Prestressing system: tendons	Loss of prestress due to relaxation; shrinkage; creep; elevated temperature	TLAA, SRP-SLR Section 4.5, "Concrete Containment Tendon Prestress," and/or SRP-SLR Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses"	Yes (SRP-SLR Section 3.5.2.2.1.4)	Consistent with NUREG-2191. Containment tendon loss of preload is a TLAA, as defined in 10 CFR 54.3. The evaluation of this TLAA is addressed in Section 4.5. Containment tendon loss of preload is managed under the *ASME Section XI, Subsection IWL* (B2.1.29) program and *Concrete Containment Unbonded Tendon Prestress* (B3.4) program. The *Concrete Containment Unbonded Tendon Prestress* (B3.4) program takes some exceptions to NUREG-2191. The secondary shield wall tendons have also been aligned to this item. Loss of prestress of secondary shield wall tendons is managed by the plant specific *Secondary Shield Wall Tendon Surveillance* (B4.1) program. See further evaluation in Section 3.5.2.2.1.4.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-009	Metal liner, metal plate, personnel airlock, equipment hatch, CRD hatch, penetration sleeves; penetration bellows, steel elements: torus; vent line; vent header; vent line bellows; downcomers, suppression pool shell; unbraced downcomers, steel elements: vent header; downcomers	Cumulative fatigue damage due to cyclic loading (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, “Containment Liner Plate and Penetration Fatigue Analysis”	Yes (SRP-SLR Section 3.5.2.2.1.5)	Consistent with NUREG-2191. Containment Liner and containment penetration fatigue cracking is a time-limited aging analysis (TLAA), as defined in 10 CFR 54.3. The evaluation of this TLAA is addressed in Section 4.6. See further evaluation in Section 3.5.2.2.1.5.
3.5.1-010	Penetration sleeves; penetration bellows	Cracking due to SCC	AMP XI.S1, “ASME Section XI, Subsection IWE,” and AMP XI.S4, “10 CFR Part 50, Appendix J”	Yes (SRP-SLR Section 3.5.2.2.1.6)	Not applicable. ONS containment does not have stainless steel (SS) penetration sleeves, penetration bellows, vent line bellows, or suppression chamber shell (interior surface) as part of the Containment pressure boundary. See further evaluation in Section 3.5.2.2.1.6. The associated NUREG-2191 aging items are not used.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-011	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program, or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring" enhanced as necessary	Yes (SRP-SLR Section 3.5.2.2.1.7)	Consistent with NUREG-2191. See further evaluation in Section 3.5.2.2.1.7.
3.5.1-012	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, containment, concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program, or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring" enhanced as necessary	Yes (SRP-SLR Section 3.5.2.2.1.8)	Consistent with NUREG-2191. See further evaluation in Section 3.5.2.2.1.8.
3.5.1-014	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, containment	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program, or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring" enhanced as necessary	Yes (SRP-SLR Section 3.5.2.2.1.9)	Consistent with NUREG-2191. See further evaluation in Section 3.5.2.2.1.9.
3.5.1-016	Concrete (inaccessible areas): basemat, concrete: containment; wall	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP-XI.S6, "Structures Monitoring"	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-018	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP-XI.S6, "Structures Monitoring"	No	Consistent with NUREG-2191.
3.5.1-019	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, containment; concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP-XI.S6, "Structures Monitoring"	No	Consistent with NUREG-2191.
3.5.1-020	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, containment	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL"	No	Consistent with NUREG-2191.
3.5.1-021	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP-XI.S6, "Structures Monitoring"	No	Consistent with NUREG-2191.
3.5.1-023	Concrete (inaccessible areas): basemat; reinforcing steel, dome; wall	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP-XI.S6, "Structures Monitoring"	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-024	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, concrete (accessible areas): dome; wall; basemat	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, “ASME Section XI, Subsection IWL,” and/or AMP-XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191.
3.5.1-026	Moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to water, damage, erosion, tear, surface cracks, other defects	AMP XI.S1, “ASME Section XI, Subsection IWE”	No	Consistent with NUREG-2191.
3.5.1-027	Metal liner, metal plate, airlock, equipment hatch, CRD hatch; penetration sleeves; penetration bellows, steel elements: torus; vent line; vent header; vent line bellows; downcomers, suppression pool shell	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, “ASME Section XI, Subsection IWE,” and AMP XI.S4, “10 CFR Part 50, Appendix J”	Yes (SRP-SLR Section 3.5.2.2.1.5)	Not applicable. Cracking due to cyclic loading of the Containment liner and penetrations is a time-limited aging analysis (TLAA), as defined in 10 CFR 54.3. The evaluation of this TLAA is addressed in Section 4.6. The associated NUREG-2191 aging items are not used.
3.5.1-028	Personnel airlock, equipment hatch, CRD hatch	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, “ASME Section XI, Subsection IWE,” and AMP XI.S4, “10 CFR Part 50, Appendix J”	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-029	Personnel airlock, equipment hatch, CRD hatch: locks, hinges, and closure mechanisms	Loss of leak tightness due to mechanical wear	AMP XI.S1, “ASME Section XI, Subsection IWE,” and AMP XI.S4, “10 CFR Part 50, Appendix J”	No	Consistent with NUREG-2191.
3.5.1-030	Pressure-retaining bolting	Loss of preload due to self-loosening	AMP XI.S1, “ASME Section XI, Subsection IWE,” and AMP XI.S4, “10 CFR Part 50, Appendix J”	No	Consistent with NUREG-2191.
3.5.1-031	Pressure-retaining bolting, steel elements: downcomer pipes	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, “ASME Section XI, Subsection IWE”		Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-032	Prestressing system: tendons; anchorage components	Loss of material due to corrosion	AMP XI.S2, "ASME Section XI, Subsection IWL"	No	Consistent with NUREG-2191. Loss of material for the Containment tendons and anchorage components is managed by the *ASME Section XI, Subsection IWL* (B2.1.29) program; this AMR line is consistent with NUREG-2191. The secondary shield wall tendons are also aligned to this item. Loss of material for the Secondary Shield Wall tendons is managed by the plant specific *Secondary Shield Wall Tendon Surveillance* (B4.1) program, and is assigned Standard Note E. See Section 3.5.2.2.1.4 for additional discussion.
3.5.1-033	Seals and gaskets	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S4, "10 CFR Part 50, Appendix J"	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-034	Service Level I coatings	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage	AMP XI.S8, "Protective Coating Monitoring and Maintenance"	No	Consistent with NUREG-2191.
3.5.1-035	Steel elements (accessible areas): liner; liner anchors; integral attachments, penetration sleeves, drywell shell; drywell head; drywell shell in sand pocket regions; suppression chamber; drywell; embedded shell; region shielded by diaphragm floor (as applicable)	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes (SRP-SLR Section 3.5.2.2.1.3.1)	Consistent with NUREG-2191. See further evaluation in Section 3.5.2.2.1.3.
3.5.1-036	Steel elements: drywell head; downcomers	Loss of material due to mechanical wear, including fretting	AMP XI.S1, "ASME Section XI, Subsection IWE"	No	Not applicable. BWR only.
3.5.1-037	Steel elements: suppression chamber (torus) liner (interior surface)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No	Not applicable. BWR only.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-038	Steel elements: suppression chamber shell (interior surface)	Cracking due to SCC	AMP XI.S1, “ASME Section XI, Subsection IWE,” and AMP XI.S4, “10 CFR Part 50, Appendix J”	Yes (SRP-SLR Section 3.5.2.2.1.6)	Not applicable. BWR only.
3.5.1-039	Steel elements: vent line bellows	Cracking due to SCC	AMP XI.S1, “ASME Section XI, Subsection IWE,” and AMP XI.S4, “10 CFR Part 50, Appendix J”	Yes (SRP-SLR Section 3.5.2.2.1.6)	Not applicable. BWR only.
3.5.1-040	Unbraced downcomers, steel elements: vent header; downcomers	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, “ASME Section XI, Subsection IWE”	Yes (SRP-SLR Section 3.5.2.2.1.5)	Not applicable. BWR only.
3.5.1-041	Steel elements: drywell support skirt, steel elements (inaccessible areas): support skirt	None	None	No	Not applicable. BWR only.
3.5.1-042	Groups 1-3, 5, 7-9: concrete (inaccessible areas): foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program, or AMP XI.S6, “Structures Monitoring” enhanced as necessary	Yes (SRP-SLR Section 3.5.2.2.2.1.1)	Consistent with NUREG-2191. See further evaluation in Section 3.5.2.2.2.1.
3.5.1-043	All Groups except Group 6: concrete (inaccessible areas): all	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program, or AMP XI.S6, “Structures Monitoring” enhanced as necessary	Yes (SRP-SLR Section 3.5.2.2.2.1.2)	Consistent with NUREG-2191. See further evaluation in Section 3.5.2.2.2.1.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-044	All Groups: concrete: all	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes (SRP-SLR Section 3.5.2.2.2.1.3)	Consistent with NUREG-2191, except that a different program is used for concrete elements of the Keowee Hydro Station Penstock, Power Tunnels, and Spillway. FERC Inspections of the Keowee Hydro Station is credited for aging management of these components. See further evaluation in Section 3.5.2.2.2.1.
3.5.1-046	Groups 1-3, 5, 7-9: concrete: foundation; subfoundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes (SRP-SLR 3.5.2.2.2.1.3)	Consistent with NUREG-2191. See further evaluation in Section 3.5.2.2.2.1.
3.5.1-047	Groups 1-5, 7-9: concrete (inaccessible areas): exterior above - and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program, or AMP XI.S6, "Structures Monitoring" enhanced as necessary	Yes (SRP-SLR 3.5.2.2.2.1.4)	Consistent with NUREG-2191. The *Structures Monitoring* program (B2.1.33) confirms the absence of aging effects related to leaching of calcium hydroxide and carbonation. See further evaluation in Section 3.5.2.2.2.1.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-048	Groups 1-5: concrete: all	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program, or AMP XI.S6, "Structures Monitoring" enhanced as necessary	Yes (SRP-SLR 3.5.2.2.2.2)	Not applicable. See further evaluation in Section 3.5.2.2.2.2. The associated NUREG-2191 aging items are not used.
3.5.1-049	Group 6 - concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program, or AMP XI.S6, "Structures Monitoring" enhanced as necessary	Yes (SRP-SLR 3.5.2.2.2.3.1)	Consistent with NUREG-2191. See further evaluation in Section 3.5.2.2.2.3.
3.5.1-050	Groups 6: concrete (inaccessible areas): all	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program, or AMP XI.S6, "Structures Monitoring" enhanced as necessary	Yes (SRP-SLR 3.5.2.2.2.3.2)	Consistent with NUREG-2191. ASR progression at the Keowee Dam spillway is monitored by the Dam Safety Surveillance and Monitoring Plan, which is implemented to meet the guidelines of FERC and is evaluated as part of the FERC Part 12D inspection. See further evaluation in Section 3.5.2.2.2.3.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-051	Groups 6: concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program, or AMP XI.S6, “Structures Monitoring” enhanced as necessary	Yes (SRP-SLR 3.5.2.2.2.3.3)	Consistent with NUREG-2191. See further evaluation in Section 3.5.2.2.2.3.
3.5.1-052	Groups 7, 8 - steel components: tank liner	Cracking due to SCC; Loss of material due to pitting and crevice corrosion	Plant-specific AMP	Yes (SRP-SLR 3.5.2.2.2.4)	Not applicable. ONS has no stainless steel tank liners in the scope of subsequent license renewal. The associated NUREG-2191 aging items are not used.
3.5.1-053	Support members; welds; bolted connections; support anchorage to building structure	Cumulative fatigue damage due to cyclic loading (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.3 “Metal Fatigue,” and/or Section 4.7 “Other Plant-Specific Time-Limited Aging Analyses”	Yes (SRP-SLR Section 3.5.2.2.2.5)	Consistent with NUREG-2191. The evaluation of fatigue for component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports is a TLAA as defined in 10 CFR 54.3, and is addressed in SLRA Section 4.3. See further evaluation in Section 3.5.2.2.2.5.
3.5.1-054	All groups except 6: concrete (accessible areas): all	Cracking due to expansion from reaction with aggregates	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-055	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Reduction in concrete anchor capacity due to local concrete degradation/service-induced cracking or other concrete aging mechanisms	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191.
3.5.1-056	Concrete: exterior above- and below- grade; foundation; interior slab	Loss of material due to abrasion; cavitation	AMP XI.S7, “Inspection of Water-Control Structures Associated with Nuclear Power Plants” or the FERC/ US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-2191.
3.5.1-057	Constant and variable load spring hangers; guides; stops	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-2191.
3.5.1-058	Earthen water-control structures: dams; embankments; reservoirs; channels; canals and ponds	Loss of material; loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	AMP XI.S7, “Inspection of Water-Control Structures Associated with Nuclear Power Plants” or the FERC/ US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-059	Group 6: concrete (accessible areas): all	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/ US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-2191.
3.5.1-060	Group 6: concrete (accessible areas): exterior above- and below-grade; foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/ US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-2191.
3.5.1-061	Group 6: concrete (accessible areas): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/ US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-062	Group 6: Wooden Piles; sheeting	Loss of material: change in material properties due to weathering, chemical degradation, and insect infestation repeated wetting and drying, fungal decay	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/ US Army Corp of Engineers dam inspections and maintenance programs.	No	Not applicable. ONS has no wooden piles; sheeting in the scope of subsequent license renewal. The associated NUREG-2191 aging items are not used.
3.5.1-063	Groups 1-3, 5, 7-9: concrete (accessible areas): exterior above- and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No	Consistent with NUREG-2191.
3.5.1-064	Groups 1-3, 5, 7-9: concrete (accessible areas): exterior above- and below-grade; foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-065	Groups 1-3, 5, 7-9: concrete (inaccessible areas): below-grade exterior; foundation, Groups 1-3, 5, 7-9: concrete (accessible areas): below-grade exterior; foundation, Groups 6: concrete (inaccessible areas): all	Cracking; loss of bond; and loss of material (spaling, scaling) due to corrosion of embedded steel	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191, except that a different program is used for concrete (inaccessible areas) of the Keowee Hydro Station Penstock, Power Tunnels, and Spillway. FERC Inspections of the Keowee Hydro Station is credited for aging management of these components.
3.5.1-066	Groups 1-5, 7, 9: concrete (accessible areas): interior and above-grade exterior	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191.
3.5.1-067	Groups 1-5, 7, 9: Concrete: interior; above-grade exterior, Groups 1-3, 5, 7-9 - concrete (inaccessible areas): below-grade exterior; foundation, Group 6: concrete (inaccessible areas): all	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191, except that a different program is used for concrete (inaccessible areas) of the Keowee Hydro Station Penstock, Power Tunnels, and Spillway. FERC Inspections of the Keowee Hydro Station is credited for aging management of these components.
3.5.1-068	High-strength steel structural bolting	Cracking due to SCC	AMP XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-070	Masonry walls: all	Cracking due to restraint shrinkage, creep, aggressive environment	AMP XI.S5, “Masonry Walls”	No	Consistent with NUREG-2191.
3.5.1-071	Masonry walls: all	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, “Masonry Walls”	No	Not applicable. ONS has no masonry walls in an outdoor environment in the scope of Subsequent License Renewal.
3.5.1-072	Seals; gasket; moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191.
3.5.1-073	Service Level I coatings	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage	AMP XI.S8, “Protective Coating Monitoring and Maintenance”	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-074	Sliding support bearings; sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S6, “Structures Monitoring”	No	Not applicable. ONS has no sliding support surfaces in the scope of subsequent license renewal outside of the scope of the *ASME Section XI, Subsection IWF* (B2.1.30) program. The associated NUREG-2191 aging items are not used.
3.5.1-075	Sliding Surfaces	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-2191.
3.5.1-076	Sliding surfaces: radial beam seats in BWR drywell	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S6, “Structures Monitoring”	No	Not applicable. BWR only.
3.5.1-077	Steel components: all structural steel	Loss of material due to corrosion	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191.
3.5.1-078	Stainless steel fuel pool liner	Cracking due to SCC; Loss of material due to pitting and crevice corrosion	AMP XI.M2, “Water Chemistry,” and monitoring of the spent fuel pool water level and leakage from the leak chase channels.	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-079	Steel components: piles	Loss of material due to corrosion	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191.
3.5.1-080	Structural bolting	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191.
3.5.1-081	Structural bolting	Loss of material due to general, pitting, crevice corrosion	AMP XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-2191.
3.5.1-082	Structural bolting	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191.
3.5.1-083	Structural bolting	Loss of material due to general, pitting, crevice corrosion	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants” or the FERC/ US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-2191.
3.5.1-085	Structural bolting	Loss of material due to pitting, crevice corrosion	AMP XI.M2, “Water Chemistry” and AMP XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-086	Structural bolting	Loss of material due to general, pitting, crevice corrosion	AMP XI.S3, “ASME Section XI, Subsection IWF”	No	Not applicable. ONS has no in-scope stainless steel structural bolting exposed to air-outdoor that is managed by the *ASME Section XI, Subsection IWF* (B2.1.30) program in Containments, Structures, and Component Supports. The associated NUREG-2191 aging items are not used.
3.5.1-087	Structural bolting	Loss of preload due to self-loosening	AMP XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-088	Structural bolting	Loss of preload due to self-loosening	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191, except that a different program is used as follows: (1) The *Inspection of Water-Control Structures Associated with Nuclear Power Plants* (B2.1.34) program will be used to manage loss of preload due to self-loosening for submerged bolting at the Keowee Hydro Station and the Intake Structure. (2) FERC Inspections of the Keowee Hydro Station are crediting with aging management of structural bolting of the Keowee Hydro Station Penstock, Power Tunnels and Spillway.
3.5.1-089	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to boric acid corrosion	AMP XI.M10, “Boric Acid Corrosion”	No	Consistent with NUREG-2191.
3.5.1-090	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M2, “Water Chemistry,” and AMP XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-091	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general, pitting corrosion	AMP XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with NUREG-2191.
3.5.1-092	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general, pitting corrosion	AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191, except that a different program is used for steel support members of the Trash Rack Filter. The *Inspection of Water-Control Structures Associated with Nuclear Power Plants* (B2.1.34) program will be used to manage loss of material due to general and pitting corrosion of these components.
3.5.1-093	Galvanized steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting, crevice corrosion	AMP XI.S6, “Structures Monitoring”	No	Not applicable. Galvanized steel components are evaluated using NUREG-2191 items for Steel. The associated NUREG-2191 aging items are not used.
3.5.1-094	Vibration isolation elements	Reduction or loss of isolation function due to radiation hardening, temperature, humidity, sustained vibratory loading	AMP XI.S3, “ASME Section XI, Subsection IWF,” and/or AMP XI.S6, “Structures Monitoring?	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-095	Galvanized steel support members; welds; bolted connections; support anchorage to building structure	None	None	No	Not applicable. Galvanized steel components are evaluated using NUREG-2191 items for Steel. The associated NUREG-2191 aging items are not used.
3.5.1-096	Group 6: concrete (accessible areas): all	Cracking due to expansion from reaction with aggregates	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants"	No	Consistent with NUREG-2191, except that a different program is used for concrete (accessible areas) of the Keowee Hydro Station Penstock, Power Tunnels, and Spillway. FERC Inspections of the Keowee Hydro Station is credited for aging management of these components.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-097	Group 4: Concrete (reactor cavity area proximate to the reactor vessel): reactor (primary/biological) shield wall; sacrificial shield wall; reactor vessel support/ pedestal structure	Reduction of strength; loss of mechanical properties due to irradiation (i.e., radiation interactions with material and radiation-induced heating)	Plant-specific aging management program or other selected AMPs or plant-specific enhancements to selected AMPs	Yes (SRP-SLR Section 3.5.2.2.2.6)	Not applicable. The evaluation of fluence/ irradiation of the shield wall determined that fluence values through 80 years of operation remain below threshold values at which aging effects might be expected. See further evaluation in Section 3.5.2.2.2.6. The associated NUREG-2191 aging items are not used.
3.5.1-098	Stainless steel, aluminum alloy support members; welds; bolted connections; support anchorage to building structure	None	None	No	Consistent with NUREG-2191.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-099	Aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion, cracking due to SCC	AMP XI.M32, "One-Time Inspection," AMP XI.S3, "ASME Section XI, Subsection IWF," or AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes (SRP-SLR Section 3.5.2.2.2.4)	Consistent with NUREG-2191. The *ASME Section XI, Subsection IWF* program (B2.1.30) will manage the aging of stainless steel and aluminum component supports to ensure that these components continue to perform their intended functions during the subsequent period of extended operation. See further evaluation in Section 3.5.2.2.2.4.

Table 3.5.1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-100	Aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion, cracking due to SCC	AMP XI.M32, "One-Time Inspection," AMP XI.S6, "Structures Monitoring," or AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes (SRP-SLR Section 3.5.2.2.2.4)	Consistent with NUREG-2191 except that a different program is used as follows: (1) Stainless steel components of the trash rack filter at the intake structure will be managed by the *Inspection of Water-Control Structures Associated with Nuclear Power Plants* (B2.1.34) program. (2) Stainless steel structural elements and bolting of the Keowee Hydro Station Penstock, Power Tunnels, and Spillway will be managed by the FERC Inspections of the Keowee Hydro Station. See further evaluation in Section 3.5.2.2.2.4.

Results Tables: Containments, Structures, And Component Supports AMR

Table 3.5.2-1 Containments, Structures, and Component Supports - Auxiliary Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B1.1.T-25	3.5.1- 089	A
Battery Rack	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B3.TP-43	3.5.1- 092	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B3.T-25	3.5.1- 089	A
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A
Concrete Elements	FB; FLD; HS; MB; PB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1

Table 3.5.2-1 Containments, Structures, and Component Supports - Auxiliary Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements	FB; FLD; HS; MB; PB; SP; SS	Concrete	Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Air (External)	Cracking, Loss of Material	Fire Protection (B2.1.15)	VII.G.A-90	3.3.1- 060	A,1
					Structures Monitoring (B2.1.33)	VII.G.A-90	3.3.1- 060	A,1
			Groundwater/Soil (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-27	3.5.1- 065	A,1
			Soil (External)	Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
Concrete Elements (Accessible)	FB; FLD; HS; MB; PB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1

Table 3.5.2-1 Containments, Structures, and Component Supports - Auxiliary Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Accessible)	FB; FLD; HS; MB; PB; SP; SS	Concrete	Air – Outdoor (External)	Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	FB; FLD; HS; MB; PB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
			Groundwater/Soil (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1

Table 3.5.2-1 Containments, Structures, and Component Supports - Auxiliary Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Inaccessible)	FB; FLD; HS; MB; PB; SP; SS	Concrete	Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Concrete Hatches	FB; MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A
						III.A3.TP-25	3.5.1- 054	A
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A
Cranes: Rails, Bridges, Structural Members, Structural Components	SS	Steel	Air (External)	Cumulative Fatigue Damage	TLAA	VII.B.A-06	3.3.1- 001	A
				Loss of Material, Wear, Deformation, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-07	3.3.1- 052	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	C

Table 3.5.2-1 Containments, Structures, and Component Supports - Auxiliary Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cranes: Structural Bolting	SS	Steel	Air (External)	Loss of Preload, Loss of Material, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-730	3.3.1- 199	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	C
Doors	FB; FLD; PB; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air (External)	Loss of Material	Fire Protection (B2.1.15)	VII.G.A-21	3.3.1- 059	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A
Fiber Reinforced Polymer	SS	Fiber Reinforced Polymer	Air – Outdoor (External)	Hardening or Loss of Strength, Loss of Material, Cracking or Blistering	Structures Monitoring (B2.1.33)	None	None	J
Lead Shield Support	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Masonry Wall	FB; SS; SP	Concrete Block	Air – Indoor Uncontrolled (External)	Cracking	Masonry Walls (B2.1.32)	III.A3.T-12	3.5.1- 070	A,6
		Masonry Walls	Air (External)	Cracking	Fire Protection (B2.1.15)	VII.G.A-626	3.3.1- 179	A,6
					Masonry Walls (B2.1.32)	VII.G.A-626	3.3.1- 179	A,6

Table 3.5.2-1 Containments, Structures, and Component Supports - Auxiliary Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Metal Siding	FB; PB; SP;	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A
Roof Membrane	SP	Elastomer, Rubber and Other Similar Materials	Air – Outdoor (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
Spent Fuel Pool Liner Plates	PB; SP; SS	Stainless Steel	Air with Borated Water Leakage (External)	None	None	III.B1.2.TP-4	3.5.1- 098	A
			Concrete (External)	None	None	VII.J.AP-19	3.3.1- 202	C
			Treated Borated Water (External)	Cracking, Loss of Material	Structures Monitoring (B2.1.33)	III.A5.T-14	3.5.1- 078	A,7
					Water Chemistry (B2.1.2)	III.A5.T-14	3.5.1- 078	A
Spent Fuel Storage Rack	SP; SS	Stainless Steel	Treated Borated Water (External)	Loss of Material	One-Time Inspection (B2.1.20)	VII.A2.A-99	3.3.1- 125	A
					Water Chemistry (B2.1.2)	VII.A2.A-99	3.3.1- 125	A
			Treated Borated Water >60°C (>140°F) (External)	Cracking	One-Time Inspection (B2.1.20)	VII.A2.A-97	3.3.1- 124	A
					Water Chemistry (B2.1.2)	VII.A2.A-97	3.3.1- 124	A

Table 3.5.2-1 Containments, Structures, and Component Supports - Auxiliary Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Stainless Steel Elements	SP; SS	Stainless Steel	Air with Borated Water Leakage (External)	None	None	III.B5.TP-4	3.5.1- 098	A,3
Steel Elements	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	C,2
Sump	SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,5
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,5
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,5
		Stainless Steel	Air with Borated Water Leakage (External)	None	None	III.B5.TP-4	3.5.1- 098	A,5
			Concrete (External)	None	None	VII.J.AP-19	3.3.1- 202	C,5

Table 3.5.2-1 Containments, Structures, and Component Supports - Auxiliary Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, stairs, platforms, grating, decking, ladders and embedded steel.
3. Stainless steel elements include fall restraint system.
4. None.
5. Sump includes the concrete sump and the stainless steel lined concrete cover for the low and high activity tanks.
6. The Masonry Walls are internal to the building structure and are not subject to air - outdoor aging effects.
7. The Structures Monitoring AMP is credited for monitoring the leak chase channels for liner leakage.

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchorage/ Embedments/ Attachments	PB; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	10 CFR 50, Appendix J (B2.1.31)	II.A1.CP-35	3.5.1- 035	A, 2
						II.A1.CP-98	3.5.1- 005	A, 1
					ASME Section XI, Subsection IWE (B2.1.28)	II.A1.CP-35	3.5.1- 035	A, 2
						II.A1.CP-98	3.5.1- 005	A, 1
					Structures Monitoring (B2.1.33)	III.B3.TP-43	3.5.1- 092	A
						III.B5.TP-43	3.5.1- 092	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	C
Bolting (Pressure Retaining)	PB	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	ASME Section XI, Subsection IWE (B2.1.28)	II.A3.CP-148	3.5.1- 031	A
				Loss of Preload	10 CFR 50, Appendix J (B2.1.31)	II.A3.CP-150	3.5.1- 030	A
					ASME Section XI, Subsection IWE (B2.1.28)	II.A3.CP-150	3.5.1- 030	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	C
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A4.TP-248	3.5.1- 080	A

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Preload	Structures Monitoring (B2.1.33)	III.A4.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A4.TP-274	3.5.1- 082	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A4.TP-261	3.5.1- 088	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	C
Buttresses	SS; SP; MB; HS	Concrete	Air – Outdoor (External)	Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-33	3.5.1- 019	A, 2
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-68	3.5.1- 021	A, 2
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-87	3.5.1- 016	A, 2
				Loss of Material (Spalling, Scaling), Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-31	3.5.1- 018	A, 2
			Soil (External)	Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-67	3.5.1- 012	A,1
				Cracking, Distortion	Structures Monitoring (B2.1.33)	II.A1.CP-101	3.5.1- 001	A,1

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Buttresses	SS; SP; MB; HS	Concrete	Soil (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-97	3.5.1- 023	A,1
				Loss of Material (Spalling, Scaling), Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-147	3.5.1- 011	A,1
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-102	3.5.1- 014	A,1
						II.A1.CP-32	3.5.1- 020	A, 2
Concrete Elements	FLD; HS; MB; PB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A4.TP-28	3.5.1- 067	A,6
	SP; SS	Concrete	Air – Indoor Uncontrolled (External)	None	None	III.A4.T-35	3.5.1- 097	I,10
						III.A4.TP-114	3.5.1- 048	I,11
Concrete Elements (Accessible)	FLD; HS; MB; PB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A4.TP-25	3.5.1- 054	A,6
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A4.TP-26	3.5.1- 066	A,6
Concrete Elements (Inaccessible)	FLD; HS; MB; PB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A4.TP-204	3.5.1- 043	A,6

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cranes: Rails, Bridges, Structural Members, Structural Components	SS	Steel	Air (External)	Cumulative Fatigue Damage	TLAA	VII.B.A-06	3.3.1- 001	A
				Loss of Material, Wear, Deformation, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-07	3.3.1- 052	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	C
Cranes: Structural Bolting	SS	Steel	Air (External)	Loss of Preload, Loss of Material, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-730	3.3.1- 199	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	C
Cylinder Walls	SS; SP; FB; MB; HS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-67	3.5.1- 012	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-97	3.5.1- 023	A, 1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-100	3.5.1- 024	A, 1

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cylinder Walls	SS; SP; FB; MB; HS	Concrete	Air – Outdoor (External)	Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-33	3.5.1- 019	A, 2
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-68	3.5.1- 021	A, 2
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-87	3.5.1- 016	A, 2
				Loss of Material (Spalling, Scaling), Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-31	3.5.1- 018	A, 2
				None	None	II.A1.CP-34	3.5.1- 003	I,5
			Soil (External)	Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-67	3.5.1- 012	A,1
				Cracking, Distortion	Structures Monitoring (B2.1.33)	II.A1.CP-101	3.5.1- 001	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-97	3.5.1- 023	A,1
				Loss of Material (Spalling, Scaling), Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-147	3.5.1- 011	A,1

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cylinder Walls	SS; SP; FB; MB; HS	Concrete	Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-102	3.5.1- 014	A,1
						II.A1.CP-32	3.5.1- 020	A, 2
Dome	SS; SP; MB; HS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-67	3.5.1- 012	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-97	3.5.1- 023	A, 1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-100	3.5.1- 024	A, 1
			Air – Outdoor (External)	Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-33	3.5.1- 019	A, 2
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-68	3.5.1- 021	A, 2
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-87	3.5.1- 016	A, 2

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Dome	SS; SP; MB; HS	Concrete	Air – Outdoor (External)	Loss of Material (Spalling, Scaling), Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-31	3.5.1- 018	A, 2
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-32	3.5.1- 020	A, 2
Doors	FLD; PB; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A4.TP-302	3.5.1- 077	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A
Floor	SS; SP; MB; HS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-33	3.5.1- 019	A,2,7
						II.A1.CP-67	3.5.1- 012	A,1,7
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-68	3.5.1- 021	A,2,7
						II.A1.CP-97	3.5.1- 023	A,1,7
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-100	3.5.1- 024	A,1,7
						II.A1.CP-87	3.5.1- 016	A,2,7

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Foundation Slab	SS; SP; MB; HS	Concrete	Air – Outdoor (External)	Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-33	3.5.1- 019	A, 2
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-68	3.5.1- 021	A, 2
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-87	3.5.1- 016	A, 2
				Loss of Material (Spalling, Scaling), Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-31	3.5.1- 018	A, 2
			Soil (External)	Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-67	3.5.1- 012	A,1
				Cracking, Distortion	Structures Monitoring (B2.1.33)	II.A1.CP-101	3.5.1- 001	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-97	3.5.1- 023	A,1
				Loss of Material (Spalling, Scaling), Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-147	3.5.1- 011	A,1
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-102	3.5.1- 014	A,1

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Foundation Slab	SS; SP; MB; HS	Concrete	Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-32	3.5.1- 020	A, 2
				Reduction in Foundation Strength, Cracking	Structures Monitoring (B2.1.33)	II.A1.C-07	3.5.1- 002	A, 1
Lead Shield Support	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A4.TP-302	3.5.1- 077	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A
Liner; Liner Anchors; Integral Attachments	PB; SS; HS	Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage	TLAA	II.A3.C-13	3.5.1- 009	A
				Loss of Material	10 CFR 50, Appendix J (B2.1.31)	II.A1.CP-35	3.5.1- 035	A, 2
						II.A1.CP-98	3.5.1- 005	A, 1
					ASME Section XI, Subsection IWE (B2.1.28)	II.A1.CP-35	3.5.1- 035	A, 2
						II.A1.CP-98	3.5.1- 005	A, 1
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	C
Masonry Wall	SP; SS	Concrete Block	Air – Indoor Uncontrolled (External)	Cracking	Masonry Walls (B2.1.32)	III.A5.T-12	3.5.1- 070	A

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Moisture Barrier	SP	Elastomer, Rubber and Other Similar Materials	Air – Indoor Uncontrolled (External)	Loss of Sealing	ASME Section XI, Subsection IWE (B2.1.28)	II.A3.CP-40	3.5.1- 026	A
Penetrations	PB; SS	Steel	Air – Indoor Uncontrolled (External)	Cracking	10 CFR 50, Appendix J (B2.1.31)	II.A3.CP-38	3.5.1- 010	A
					ASME Section XI, Subsection IWE (B2.1.28)	II.A3.CP-38	3.5.1- 010	A
				Cumulative Fatigue Damage	TLAA	II.A3.C-13	3.5.1- 009	A
				Loss of Material	10 CFR 50, Appendix J (B2.1.31)	II.A3.CP-36	3.5.1- 035	A, 2
					ASME Section XI, Subsection IWE (B2.1.28)	II.A3.CP-36	3.5.1- 035	A, 2
			Air – Outdoor (External)	Cracking	10 CFR 50, Appendix J (B2.1.31)	II.A3.CP-38	3.5.1- 010	A
					ASME Section XI, Subsection IWE (B2.1.28)	II.A3.CP-38	3.5.1- 010	A
				Cumulative Fatigue Damage	TLAA	II.A3.C-13	3.5.1- 009	A
				Loss of Material	10 CFR 50, Appendix J (B2.1.31)	II.A3.CP-36	3.5.1- 035	A, 2

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Penetrations	PB; SS	Steel	Air – Outdoor (External)	Loss of Material	ASME Section XI, Subsection IWE (B2.1.28)	II.A3.CP-36	3.5.1- 035	A, 2
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	C
Personnel Hatch; Emergency Personnel Hatch; Equipment Hatch	PB	Steel	Air – Indoor Uncontrolled (External)	Loss of Leak Tightness	10 CFR 50, Appendix J (B2.1.31)	II.A3.CP-39	3.5.1- 029	A
					ASME Section XI, Subsection IWE (B2.1.28)	II.A3.CP-39	3.5.1- 029	A
				Loss of Material	10 CFR 50, Appendix J (B2.1.31)	II.A3.C-16	3.5.1- 028	A
					ASME Section XI, Subsection IWE (B2.1.28)	II.A3.C-16	3.5.1- 028	A
			Air – Outdoor (External)	Loss of Leak Tightness	10 CFR 50, Appendix J (B2.1.31)	II.A3.CP-39	3.5.1- 029	A
					ASME Section XI, Subsection IWE (B2.1.28)	II.A3.CP-39	3.5.1- 029	A
				Loss of Material	10 CFR 50, Appendix J (B2.1.31)	II.A3.C-16	3.5.1- 028	A
					ASME Section XI, Subsection IWE (B2.1.28)	II.A3.C-16	3.5.1- 028	A

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Personnel Hatch; Emergency Personnel Hatch; Equipment Hatch	PB	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	C
Ring Girders	SS; SP; MB; HS	Concrete	Air – Outdoor (External)	Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-33	3.5.1- 019	A, 2
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-68	3.5.1- 021	A, 2
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-87	3.5.1- 016	A, 2
				Loss of Material (Spalling, Scaling), Cracking	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-31	3.5.1- 018	A, 2
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.CP-32	3.5.1- 020	A, 2
Seals and Gaskets	PB; SP	Elastomer, Rubber and Other Similar Materials	Air – Indoor Uncontrolled (External)	Loss of Sealing	10 CFR 50, Appendix J (B2.1.31)	II.A3.CP-41	3.5.1- 033	A
			Air – Outdoor (External)	Loss of Sealing	10 CFR 50, Appendix J (B2.1.31)	II.A3.CP-41	3.5.1- 033	A

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Service Level I Coatings	MCI	Coatings	Air – Indoor Uncontrolled (External)	Loss of Coating or Lining Integrity	Protective Coating Monitoring and Maintenance (B2.1.35)	II.A3.CP-152	3.5.1- 034	A
						III.A4.TP-301	3.5.1- 073	A
Steel Elements	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A4.TP-302	3.5.1- 077	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A
	SS	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Cracking	Structures Monitoring (B2.1.33)	III.B5.T-37b	3.5.1- 100	A,3
			Air with Borated Water Leakage (External)	None	None	III.B5.TP-4	3.5.1- 098	A,3
		Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A4.TP-302	3.5.1- 077	A
		Steel (with Stainless Steel Cladding)	Air – Indoor Uncontrolled (External)	Cracking, Loss of Material	Structures Monitoring (B2.1.33)	III.B5.T-37b	3.5.1- 100	A,4
			Air with Borated Water Leakage (External)	None	None	III.B5.TP-4	3.5.1- 098	A,4
Tendon Anchorage	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.C-10	3.5.1- 032	A
					Secondary Shield Wall Tendon Surveillance Program (B4.1)	II.A1.C-10	3.5.1- 032	E,9

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Tendon Anchorage	SS	Steel	Air – Outdoor (External)	Loss of Material	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.C-10	3.5.1- 032	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A,9
Tendon Wire	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	ASME Section XI, Subsection IWL (B2.1.29)	II.A1.C-10	3.5.1- 032	A
					Secondary Shield Wall Tendon Surveillance Program (B4.1)	II.A1.C-10	3.5.1- 032	E,9
				Loss of Prestress	Secondary Shield Wall Tendon Surveillance Program (B4.1)	II.A1.C-11	3.5.1- 008	E,9
					TLAA	II.A1.C-11	3.5.1- 008	A,12
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A,9
Unit Vent	GR	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A4.TP-302	3.5.1- 077	C
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A4.TP-302	3.5.1- 077	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A

Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. This line item is associated with inaccessible areas.
2. This line item is associated with accessible areas.
3. Subject component is the fuel transfer canal annulus seal plate.
4. Subject component is the fuel transfer canal liner plate.
5. The outside main steam line penetrations for Units 1, 2, and 3 are subject concrete temperature > 200°F for local areas. Non-destructive testing has determined no significant reduction in concrete strength due to elevated temperature. Cooling fans maintain concrete on the inside of the penetration within limits. See Further Evaluation 3.5.2.2.1.2.
6. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads within the interior or above-grade exterior of the Reactor Building.
7. Subject component is the floor slab over the containment liner plate.
8. CLB fatigue analysis exists only for the main feedwater and main steam line penetration.
9. Subject component are the secondary shield wall tendons.
10. The concrete for the primary shield wall and reactor vessel support skirt embedment is not subject to reduction of strength and mechanical properties due to irradiation. See Further Evaluation 3.5.2.2.2.6.
11. The concrete for the primary shield wall and reactor vessel support skirt embedment is not subject to reduction of strength and modulus due to elevated temperatures. See Further Evaluation 3.5.2.2.2.2.
12. The tendon wire loss of prestress due to relaxation; shrinkage; creep; elevated temperature is addressed by the TLAA consistent with NUREG-2191. This aging effect is managed by ASME Section XI, Subsection IWL AMP and Concrete Containment Unbonded Tendon Prestress AMP, which takes some exceptions to NUREG-2191. See Further Evaluation 3.5.2.2.1.4.

Table 3.5.2-3 Containments, Structures, and Component Supports - Turbine Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B5.TP-43	3.5.1- 092	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements	FB; FLD; MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Air (External)	Cracking, Loss of Material	Fire Protection (B2.1.15)	VII.G.A-90	3.3.1- 060	A,1
					Structures Monitoring (B2.1.33)	VII.G.A-90	3.3.1- 060	A,1

Table 3.5.2-3 Containments, Structures, and Component Supports - Turbine Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements	FB; FLD; MB; SP; SS	Concrete	Groundwater/Soil (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-27	3.5.1- 065	A,1
			Soil (External)	Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
Concrete Elements (Accessible)	FB; FLD; MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	FB; FLD; MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1

Table 3.5.2-3 Containments, Structures, and Component Supports - Turbine Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Inaccessible)	FB; FLD; MB; SP; SS	Concrete	Groundwater/Soil (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Cranes: Rails, Bridges, Structural Members, Structural Components	SS	Steel	Air (External)	Cumulative Fatigue Damage	TLAA	VII.B.A-06	3.3.1- 001	A
				Loss of Material, Wear, Deformation, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-07	3.3.1- 052	A

Table 3.5.2-3 Containments, Structures, and Component Supports - Turbine Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cranes: Structural Bolting	SS	Steel	Air (External)	Loss of Preload, Loss of Material, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-730	3.3.1- 199	A
Doors	FB; FLD; MB; SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air (External)	Loss of Material	Fire Protection (B2.1.15)	VII.G.A-21	3.3.1- 059	A
Masonry Wall	FB; SS; SP	Concrete Block	Air – Indoor Uncontrolled (External)	Cracking	Masonry Walls (B2.1.32)	III.A3.T-12	3.5.1- 070	A,3
		Masonry Walls	Air (External)	Cracking	Fire Protection (B2.1.15)	VII.G.A-626	3.3.1- 179	A,3
					Masonry Walls (B2.1.32)	VII.G.A-626	3.3.1- 179	A,3
Metal Siding	SP	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Roof Membrane	SP	Elastomer, Rubber and Other Similar Materials	Air – Outdoor (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
Steel Elements	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Table 3.5.2-3 Containments, Structures, and Component Supports - Turbine Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Steel Elements	SP; SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations, sumps, pads and the concrete portion of the CT4 missile door.
2. Steel elements include beams, columns, baseplates, bracing, stairs, platforms, grating, decking, ladders and embedded steel (including the portion in the CT4 missile door).
3. The Masonry Walls are internal to the building structure and are not subject to air - outdoor aging effects.

Table 3.5.2-4 Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B5.TP-43	3.5.1- 092	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Battery Rack	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B3.TP-43	3.5.1- 092	A
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Water – Flowing (External)	Loss of Material	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-221	3.5.1- 083	A,7
				Loss of Preload	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A3.TP-261	3.5.1- 088	E,7

Table 3.5.2-4 Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements	MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
			Water – Flowing (External)	Reduction in Foundation Strength, Cracking	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A3.TP-31	3.5.1- 046	E,1,8
Concrete Elements (Accessible)	MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1

Table 3.5.2-4 Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Accessible)	MB; SP; SS	Concrete	Air – Outdoor (External)	Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Groundwater/Soil (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-27	3.5.1- 065	A,1
			Water – Flowing (External)	Cracking	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A3.TP-25	3.5.1- 054	E,1,8
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-38	3.5.1- 059	A,1,8
				Increase in Porosity and Permeability, Loss of Strength	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A3.TP-24	3.5.1- 063	E,1,8
Concrete Elements (Inaccessible)	MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
			Groundwater/Soil (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1

Table 3.5.2-4 Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Inaccessible)	MB; SP; SS	Concrete	Groundwater/Soil (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Concrete Hatches	SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A
						III.A3.TP-25	3.5.1- 054	A
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A

Table 3.5.2-4 Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cranes: Rails, Bridges, Structural Members, Structural Components	SS	Steel	Air (External)	Loss of Material, Wear, Deformation, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-07	3.3.1- 052	A
Cranes: Structural Bolting	SS	Steel	Air (External)	Loss of Preload, Loss of Material, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-730	3.3.1- 199	A
Doors	MB; SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Masonry Wall	SP; SS	Concrete Block	Air – Indoor Uncontrolled (External)	Cracking	Masonry Walls (B2.1.32)	III.A3.T-12	3.5.1- 070	A
Penstock, Power Tunnels, Spillway, Intake: Bolting (Structural)	SS	Stainless Steel	Air – Outdoor (External)	Loss of Material, Cracking	FERC Inspections of the Keowee Hydro Station	III.B2.T-37b	3.5.1- 100	E,6
				Loss of Preload	FERC Inspections of the Keowee Hydro Station	III.A6.TP-261	3.5.1- 088	E,6
		Steel	Air – Outdoor (External)	Loss of Material	FERC Inspections of the Keowee Hydro Station	III.A6.TP-221	3.5.1- 083	A,6

Table 3.5.2-4 Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Penstock, Power Tunnels, Spillway, Intake: Bolting (Structural)	SS	Steel	Air – Outdoor (External)	Loss of Preload	FERC Inspections of the Keowee Hydro Station	III.A6.TP-261	3.5.1- 088	E,6
			Water – Flowing (External)	Loss of Material	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-221	3.5.1- 083	A,7
				Loss of Preload	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-261	3.5.1- 088	E,7
Penstock, Power Tunnels, Spillway, Intake: Concrete Elements	DF; SS	Concrete	Soil (External)	Cracking, Distortion	FERC Inspections of the Keowee Hydro Station	III.A6.TP-30	3.5.1- 044	E,6
			Water – Flowing (External)	Loss of Material	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.T-20	3.5.1- 056	A,7
Penstock, Power Tunnels, Spillway, Intake: Concrete Elements (Accessible)	DF; SS	Concrete	Air – Outdoor (External)	Cracking	FERC Inspections of the Keowee Hydro Station	III.A6.T-34	3.5.1- 096	E,6
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	FERC Inspections of the Keowee Hydro Station	III.A6.TP-38	3.5.1- 059	A,6

Table 3.5.2-4 Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Penstock, Power Tunnels, Spillway, Intake: Concrete Elements (Accessible)	DF; SS	Concrete	Air – Outdoor (External)	Increase in Porosity and Permeability, Loss of Strength	FERC Inspections of the Keowee Hydro Station	III.A6.TP-37	3.5.1- 061	A,6
			Water – Flowing (External)	Cracking	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.T-34	3.5.1- 096	A,7
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-38	3.5.1- 059	A,7
				Increase in Porosity and Permeability, Loss of Strength	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-37	3.5.1- 061	A,7
Penstock, Power Tunnels, Spillway, Intake: Concrete Elements (Inaccessible)	DF; SS	Concrete	Groundwater/Soil (External)	Cracking	FERC Inspections of the Keowee Hydro Station	III.A6.TP-220	3.5.1- 050	E,6
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	FERC Inspections of the Keowee Hydro Station	III.A6.TP-104	3.5.1- 065	E,6

Table 3.5.2-4 Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Penstock, Power Tunnels, Spillway, Intake: Concrete Elements (Inaccessible)	DF; SS	Concrete	Groundwater/Soil (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	FERC Inspections of the Keowee Hydro Station	III.A6.TP-107	3.5.1- 067	E,6
				Loss of Material (Spalling, Scaling), Cracking	FERC Inspections of the Keowee Hydro Station	III.A6.TP-110	3.5.1- 049	E,6
			Water – Flowing (External)	Cracking	FERC Inspections of the Keowee Hydro Station	III.A6.TP-220	3.5.1- 050	E,6
				Increase in Porosity and Permeability, Loss of Strength	FERC Inspections of the Keowee Hydro Station	III.A6.TP-109	3.5.1- 051	E,6
Penstock, Power Tunnels, Spillway, Intake: Stainless Steel Elements	SS	Stainless Steel	Air – Outdoor (External)	Loss of Material, Cracking	FERC Inspections of the Keowee Hydro Station	III.B2.T-37b	3.5.1- 100	E,5,6
Penstock, Power Tunnels, Spillway, Intake: Steel Elements	DF; SS	Steel	Air – Outdoor (External)	Loss of Material	FERC Inspections of the Keowee Hydro Station	III.A6.TP-221	3.5.1- 083	C,3,6
			Concrete (External)	None	None	VII.J.AP-282	3.3.1- 112	A,3
			Water – Flowing (External)	Loss of Material	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-221	3.5.1- 083	C,3,7

Table 3.5.2-4 Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Roof Membrane	SP	Elastomer, Rubber and Other Similar Materials	Air – Indoor Uncontrolled (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
			Air – Outdoor (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
Steel Elements	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2
Trash Rack Filter	F; SS	Stainless Steel	Air – Outdoor (External)	Loss of Preload	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-261	3.5.1- 088	E,4,8
			Air (External)	Loss of Material, Cracking	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.B5.T-37b	3.5.1- 100	E,4,8
			Water – Flowing (External)	Loss of Preload	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-261	3.5.1- 088	E,4,8
		Steel	Air – Outdoor (External)	Loss of Material	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-221	3.5.1- 083	A,4,8
						III.B5.TP-43	3.5.1- 092	E,4,8

Table 3.5.2-4 Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Trash Rack Filter	F; SS	Steel	Air – Outdoor (External)	Loss of Preload	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-261	3.5.1- 088	E,4,8
			Water – Flowing (External)	Loss of Material	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-221	3.5.1- 083	A,4,8
				Loss of Preload	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-261	3.5.1- 088	E,4,8

Table 3.5.2-4 Containments, Structures, and Component Supports - Keowee Hydro Station - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, sumps, foundations and pads.
2. Steel elements include beams, columns, metal siding, baseplates, bracing, stairs, platforms, grating, decking and ladders.
3. The Penstock, Power Tunnel, Spillway and Intake Steel Elements include beams, columns, tunnel steel liner and taintor gates.
4. Trash Rack Filter includes the structural members and structural bolting.
5. The Penstock, Power Tunnel, Spillway and Intake Stainless Steel Elements include beams, columns, framing and miscellaneous stainless steel members.
6. The FERC Inspections of the Keowee Hydro Station (Dam) are the aging management program credited for the Penstock, Power Tunnels, Spillway and Intake portions of the Keowee Hydro Station (Dam). Keowee is licensed by the Federal Energy Regulatory Commission (FERC). Screening and aging management review of the Penstock, Power Tunnels, Spillway and Intake portions of the Keowee Hydro Station (Dam) were performed for the second period of extended operation based on current licensing basis established for Oconee in NUREG-1723, Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1,2, and 3. The staff concluded as stated in paragraph 3.8.3.2.2 “Aging Management Program”, “Therefore, for earthen embankments, dams, and related structures identified as being subject to an AMR, the staff concludes that continued compliance with requirements of FERC into the license renewal period, by virtue of that agency's authority and responsibility for ensuring that its regulated projects are constructed, operated, and maintained to protect life, health, and property, will constitute an acceptable dam AMP for the purposes of license renewal.” ONS will continue to comply with these FERC requirements during the second period of extended operation.
7. The Underwater Inspection and Penstock Inspection performed under the Inspection of Water-Control Structures Associated With Nuclear Power Plants program are credited for the material, environment and aging effect combination.
8. The Underwater Inspection performed under the Inspection of Water-Control Structures Associated With Nuclear Power Plants program are credited for the material, environment and aging effect combination.

Table 3.5.2-5 Containments, Structures, and Component Supports - Electrical Related Structures - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Stainless Steel	Air – Indoor Uncontrolled (External)	Loss of Material, Cracking	Structures Monitoring (B2.1.33)	III.B3.T-37b	3.5.1- 100	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material, Cracking	Structures Monitoring (B2.1.33)	III.B3.T-37b	3.5.1- 100	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B3.TP-43	3.5.1- 092	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B3.TP-43	3.5.1- 092	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Battery Rack	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B3.TP-43	3.5.1- 092	A
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A

Table 3.5.2-5 Containments, Structures, and Component Supports - Electrical Related Structures - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting (Structural)	SS	Steel	Air – Outdoor (External)	Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements (Accessible)	SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1

Table 3.5.2-5 Containments, Structures, and Component Supports - Electrical Related Structures - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Inaccessible)	SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Soil (External)	Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Doors	SP	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Masonry Wall	SS	Concrete Block	Air – Indoor Uncontrolled (External)	Cracking	Masonry Walls (B2.1.32)	III.A3.T-12	3.5.1- 070	A

Table 3.5.2-5 Containments, Structures, and Component Supports - Electrical Related Structures - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Metal Siding	SP	Aluminum	Air – Outdoor (External)	Loss of Material, Cracking	Structures Monitoring (B2.1.33)	III.B3.T-37b	3.5.1- 100	C
Roof Membrane	SP	Elastomer, Rubber and Other Similar Materials	Air – Indoor Uncontrolled (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
			Air – Outdoor (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
Steel Elements	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2
	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2
Transmission Tower	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, stairs, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-6 Containments, Structures, and Component Supports - Earthen Embankments - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Earthen Water Control Structures	SS	Various	Air – Outdoor (External)	Loss of Material, Loss of Form	FERC Inspections of the Keowee Earthen Embankments	III.A6.T-22	3.5.1- 058	A,1
			Water – Flowing (External)	Loss of Material, Loss of Form	FERC Inspections of the Keowee Earthen Embankments	III.A6.T-22	3.5.1- 058	A,1
			Water – Standing (External)	Loss of Material, Loss of Form	FERC Inspections of the Keowee Earthen Embankments	III.A6.T-22	3.5.1- 058	A,1

Plant Specific Notes:

1. The FERC Inspections of the Keowee Hydro Station (Dam) are the aging management program credited for the Earthen Embankments. Keowee is licensed by the Federal Energy Regulatory Commission (FERC). Screening and aging management review of the Earthen Embankments was performed for the second period of extended operation based on current licensing basis established for Oconee in NUREG-1723, Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1,2, and 3. The staff concluded as stated in paragraph 3.8.3.2.2 “Aging Management Program”, “Therefore, for earthen embankments, dams, and related structures identified as being subject to an AMR, the staff concludes that continued compliance with requirements of FERC into the license renewal period, by virtue of that agency's authority and responsibility for ensuring that its regulated projects are constructed, operated, and maintained to protect life, health, and property, will constitute an acceptable dam AMP for the purposes of license renewal.” ONS will continue to comply with these FERC requirements during the second period of extended operation.

Table 3.5.2-7 Containments, Structures, and Component Supports - Borated Water Storage Tank Superstructure - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192	Notes
Anchor	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A8.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A8.TP-261	3.5.1- 088	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A
Bolting (Structural)	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A8.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A8.TP-261	3.5.1- 088	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A
Concrete Elements	SS; MB	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	C,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A8.TP-25	3.5.1- 054	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	C,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A8.TP-204	3.5.1- 043	A,1

Table 3.5.2-7 Containments, Structures, and Component Supports - Borated Water Storage Tank Superstructure - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192	Notes
Concrete Elements	SS; MB	Concrete	Soil (External)	Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A8.TP-30	3.5.1- 044	A,1
			Water – Flowing (External)	Reduction in Foundation Strength, Cracking	Structures Monitoring (B2.1.33)	III.A8.TP-31	3.5.1- 046	A,1
Concrete Elements (Accessible)	SS; MB	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A8.TP-25	3.5.1- 054	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A8.TP-25	3.5.1- 054	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A8.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A8.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	SS; MB	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A8.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A8.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A8.TP-29	3.5.1- 067	A,1

Table 3.5.2-7 Containments, Structures, and Component Supports - Borated Water Storage Tank Superstructure - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192	Notes
Concrete Elements (Inaccessible)	SS; MB	Concrete	Groundwater/Soil (External)	Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A8.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A8.TP-67	3.5.1- 047	A,1
Doors	MB; SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A8.TP-302	3.5.1- 077	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A
Steel Elements	SS; MB	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A8.TP-302	3.5.1- 077	A,2
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B5.T-25	3.5.1- 089	A,2

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, stairs, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-8 Containments, Structures, and Component Supports - Essential Siphon Vacuum Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements	SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1

Table 3.5.2-8 Containments, Structures, and Component Supports - Essential Siphon Vacuum Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Accessible)	SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
	SP; SS	Concrete	Air – Outdoor (External)	Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
	SP; SS	Concrete	Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Concrete Elements (Inaccessible)	SP; SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1

Table 3.5.2-8 Containments, Structures, and Component Supports - Essential Siphon Vacuum Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Inaccessible)	SP; SS	Concrete	Groundwater/Soil (External)	Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Doors	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Metal Siding	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A2.TP-302	3.5.1- 077	A
Steel Elements	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, stairs, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-9 Containments, Structures, and Component Supports - Intake Structure - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A6.TP-261	3.5.1- 088	A
Bolting (Structural)	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A6.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A6.TP-261	3.5.1- 088	A
			Water – Flowing (External)	Loss of Material	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-221	3.5.1- 083	A
				Loss of Preload	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-261	3.5.1- 088	E
Concrete Elements	SP; SS	Concrete	Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A6.TP-220	3.5.1- 050	A,1
	SP; SS	Concrete	Soil (External)	Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A6.TP-30	3.5.1- 044	A,1
			Water – Flowing (External)	Loss of Material	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.T-20	3.5.1- 056	A,1
				Reduction in Foundation Strength, Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-31	3.5.1- 046	A,1

Table 3.5.2-9 Containments, Structures, and Component Supports - Intake Structure - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Accessible)	SP; SS	Concrete	Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A6.TP-25	3.5.1- 054	A,1
	SP; SS	Concrete	Air – Outdoor (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-38	3.5.1- 059	A,1
				Increase in Porosity and Permeability, Loss of Strength	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-37	3.5.1- 061	A,1
	SP; SS	Concrete	Water – Flowing (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-38	3.5.1- 059	A,1
	SP; SS	Concrete	Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-37	3.5.1- 061	A,1
Concrete Elements (Inaccessible)	SP; SS	Concrete	Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A6.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A6.TP-104	3.5.1- 065	A,1
	SP; SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A6.TP-220	3.5.1- 050	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A6.TP-104	3.5.1- 065	A,1

Table 3.5.2-9 Containments, Structures, and Component Supports - Intake Structure - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Inaccessible)	SP; SS	Concrete	Groundwater/Soil (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A6.TP-107	3.5.1- 067	A,1
	SP; SS	Concrete	Groundwater/Soil (External)	Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A6.TP-110	3.5.1- 049	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A6.TP-220	3.5.1- 050	A,1
	SP; SS	Concrete	Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A6.TP-109	3.5.1- 051	A,1
Steel Elements	SP; SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, stairs, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-10 Containments, Structures, and Component Supports - Protected Service Water Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Battery Rack	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B3.TP-43	3.5.1- 092	A
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements	FLD; MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1

Table 3.5.2-10 Containments, Structures, and Component Supports - Protected Service Water Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements	FLD; MB; SP; SS	Concrete	Soil (External)	Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
			Water – Flowing (External)	Reduction in Foundation Strength, Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-31	3.5.1- 046	A,1
Concrete Elements (Accessible)	FLD; MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	FLD; MB; SP; SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1

Table 3.5.2-10 Containments, Structures, and Component Supports - Protected Service Water Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Inaccessible)	FLD; MB; SP; SS	Concrete	Groundwater/Soil (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Cranes: Rails, Bridges, Structural Members, Structural Components	SS	Steel	Air (External)	Loss of Material, Wear, Deformation, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-07	3.3.1- 052	A
Cranes: Structural Bolting	SS	Steel	Air (External)	Loss of Preload, Loss of Material, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-730	3.3.1- 199	A
Doors	FLD; MB; SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A

Table 3.5.2-10 Containments, Structures, and Component Supports - Protected Service Water Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Doors	FLD; MB; SP; SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Roof Membrane	SP	Elastomer, Rubber and Other Similar Materials	Air – Outdoor (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
Steel Elements	FLD; MB; SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, stairs, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-11 Containments, Structures, and Component Supports - Protected Service Water Conduit Duct Banks - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192	Notes
Anchor	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Bolting (Structural)	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
			Water – Flowing (External)	Reduction in Foundation Strength, Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-31	3.5.1- 046	A,1
Concrete Elements (Accessible)	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1

Table 3.5.2-11 Containments, Structures, and Component Supports - Protected Service Water Conduit Duct Banks - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192	Notes
Concrete Elements (Accessible)	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	FLD; MB; SP; SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Steel Elements	FLD; MB; SP; SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Table 3.5.2-11 Containments, Structures, and Component Supports - Protected Service Water Conduit Duct Banks - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192	Notes

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-12 Containments, Structures, and Component Supports - Standby Shutdown Facility - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Battery Rack	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B3.TP-43	3.5.1- 092	A
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements	FLD; MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1

Table 3.5.2-12 Containments, Structures, and Component Supports - Standby Shutdown Facility - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements	FLD; MB; SP; SS	Concrete	Soil (External)	Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
			Water – Flowing (External)	Reduction in Foundation Strength, Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-31	3.5.1- 046	A,1
Concrete Elements (Accessible)	FLD; MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	FLD; MB; SP; SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1

Table 3.5.2-12 Containments, Structures, and Component Supports - Standby Shutdown Facility - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Inaccessible)	FLD; MB; SP; SS	Concrete	Groundwater/Soil (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Concrete Hatches	MB; SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A
Cranes: Rails, Bridges, Structural Members, Structural Components	SS	Steel	Air (External)	Loss of Material, Wear, Deformation, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-07	3.3.1- 052	A

Table 3.5.2-12 Containments, Structures, and Component Supports - Standby Shutdown Facility - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Cranes: Structural Bolting	SS	Steel	Air (External)	Loss of Preload, Loss of Material, Cracking	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.13)	VII.B.A-730	3.3.1- 199	A
Doors	FLD; MB; SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Roof Membrane	SP	Elastomer, Rubber and Other Similar Materials	Air – Outdoor (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
Steel Elements	FLD; MB; SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, stairs, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-13 Containments, Structures, and Component Supports - Radwaste Facility - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements	SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Air – Outdoor (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1

Table 3.5.2-13 Containments, Structures, and Component Supports - Radwaste Facility - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements	SP; SS	Concrete	Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
Concrete Elements (Accessible)	SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	SP; SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1

Table 3.5.2-13 Containments, Structures, and Component Supports - Radwaste Facility - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Inaccessible)	SP; SS	Concrete	Groundwater/Soil (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Doors	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Masonry Wall	SP; SS	Concrete Block	Air – Indoor Uncontrolled (External)	Cracking	Masonry Walls (B2.1.32)	III.A3.T-12	3.5.1- 070	A
Roof Membrane	SP	Elastomer, Rubber and Other Similar Materials	Air – Outdoor (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
Steel Elements	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Table 3.5.2-13 Containments, Structures, and Component Supports - Radwaste Facility - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, stairs, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-14 Containments, Structures, and Component Supports - Trenches - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Bolting (Structural)	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
			Water – Flowing (External)	Reduction in Foundation Strength, Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-31	3.5.1- 046	A,1
Concrete Elements (Accessible)	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1

Table 3.5.2-14 Containments, Structures, and Component Supports - Trenches - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Accessible)	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	FLD; MB; SP; SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1

Table 3.5.2-14 Containments, Structures, and Component Supports - Trenches - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Steel Elements	FLD; MB; SP; SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-15 Containments, Structures, and Component Supports - Technical Support Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Bolting (Structural)	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
			Water – Flowing (External)	Reduction in Foundation Strength, Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-31	3.5.1- 046	A,1
Concrete Elements (Accessible)	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1

Table 3.5.2-15 Containments, Structures, and Component Supports - Technical Support Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Accessible)	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	FLD; MB; SP; SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1

Table 3.5.2-15 Containments, Structures, and Component Supports - Technical Support Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Steel Elements	FLD; MB; SP; SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-16 Containments, Structures, and Component Supports - Elevated Water Storage Tank Structure - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Bolting (Structural)	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Steel Elements	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,1

Plant Specific Notes:

1. Steel elements include the cylindrical tank support shaft, anchor chair, and plate assemblies.

Table 3.5.2-17 Containments, Structures, and Component Supports - Microwave House Structure - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements	SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
	SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
	SP; SS	Concrete	Air – Outdoor (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1

Table 3.5.2-17 Containments, Structures, and Component Supports - Microwave House Structure - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements	SP; SS	Concrete	Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
	SP; SS	Concrete	Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
	SP; SS	Concrete	Soil (External)	Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
Concrete Elements (Accessible)	SP; SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	SP; SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1

Table 3.5.2-17 Containments, Structures, and Component Supports - Microwave House Structure - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Inaccessible)	SP; SS	Concrete	Groundwater/Soil (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Doors	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Metal Siding	SP	Aluminum	Air – Outdoor (External)	Loss of Material, Cracking	Structures Monitoring (B2.1.33)	III.B3.T-37b	3.5.1- 100	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Roof Membrane	SP	Elastomer, Rubber and Other Similar Materials	Air – Outdoor (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A

Table 3.5.2-17 Containments, Structures, and Component Supports - Microwave House Structure - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Steel Elements	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-18 Containments, Structures, and Component Supports - Manholes - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Bolting (Structural)	SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
			Water – Flowing (External)	Reduction in Foundation Strength, Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-31	3.5.1- 046	A,1
Concrete Elements (Accessible)	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1

Table 3.5.2-18 Containments, Structures, and Component Supports - Manholes - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Accessible)	FLD; MB; SP; SS	Concrete	Air – Outdoor (External)	Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	FLD; MB; SP; SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1

Table 3.5.2-18 Containments, Structures, and Component Supports - Manholes - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Steel Elements	FLD; MB; SP; SS	Steel	Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Plant Specific Notes:

1. Concrete Elements include beams, columns, walls, slabs, curbs, foundations and pads.
2. Steel elements include beams, columns, baseplates, bracing, platforms, grating, decking, ladders and embedded steel.

Table 3.5.2-19 Containments, Structures, and Component Supports - Condenser Circulating Water Discharge Pipe - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192	Notes
Piping Tunnel	DF; SS	Steel	Air – Outdoor (External)	Loss of Material	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-221	3.5.1- 083	C
			Groundwater/Soil (External)	Loss of Material	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	None	None	F
			Water – Flowing (External)	Loss of Material	Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.34)	III.A6.TP-221	3.5.1- 083	C

Plant Specific Notes:

1. None.

Table 3.5.2-20 Containments, Structures, and Component Supports - Health Physics Office Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Anchor	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.A3.TP-261	3.5.1- 088	A
Concrete Elements	SS	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
Concrete Elements (Accessible)	SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1

Table 3.5.2-20 Containments, Structures, and Component Supports - Health Physics Office Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Accessible)	SS	Concrete	Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				None	None	III.A3.TP-108	3.5.1- 042	I,1,3
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1

Table 3.5.2-20 Containments, Structures, and Component Supports - Health Physics Office Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Doors	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Metal Siding	SP	Aluminum	Air – Outdoor (External)	Loss of Material, Cracking	Structures Monitoring (B2.1.33)	III.B3.T-37b	3.5.1- 100	C
Roof Membrane	SP	Elastomer, Rubber and Other Similar Materials	Air – Outdoor (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
Steel Elements	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,2

Plant Specific Notes:

1. Concrete Elements include the footers and slabs.
2. Steel elements includes support members, bearing plates, base plates and connections
3. The concrete is not subject to loss of material (spalling, scaling) and cracking due to freeze-thaw. See Further Evaluation 3.5.2.2.2.1.1.

Table 3.5.2-21 Containments, Structures, and Component Supports - Administration Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements	SS	Concrete	Air – Indoor Uncontrolled (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
Concrete Elements (Accessible)	SS	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-23	3.5.1- 064	A,1

Table 3.5.2-21 Containments, Structures, and Component Supports - Administration Building - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Accessible)	SS	Concrete	Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	SS	Concrete	Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				None	None	III.A3.TP-108	3.5.1- 042	I,1,2
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Masonry Wall	SP; SS	Concrete Block	Air – Indoor Uncontrolled (External)	Cracking	Masonry Walls (B2.1.32)	III.A3.T-12	3.5.1- 070	A

Plant Specific Notes:

1. Concrete Elements include the foundation.
2. The concrete is not subject to loss of material (spalling, scaling) and cracking due to freeze-thaw. See Further Evaluation 3.5.2.2.2.1.1.

Table 3.5.2-22 Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Aluminum Elements	SS	Aluminum	Air (External)	Loss of Material, Cracking	Structures Monitoring (B2.1.33)	III.B2.T-37b	3.5.1- 100	A,2
						III.B3.T-37b	3.5.1- 100	A,2
						III.B4.T-37b	3.5.1- 100	A,2
						III.B5.T-37b	3.5.1- 100	A,2
Anchor	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B2.TP-43	3.5.1- 092	A
						III.B3.TP-43	3.5.1- 092	A
						III.B4.TP-43	3.5.1- 092	A
						III.B5.TP-43	3.5.1- 092	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B2.T-25	3.5.1- 089	A,5
						III.B3.T-25	3.5.1- 089	A,5
						III.B4.T-25	3.5.1- 089	A,5
						III.B5.T-25	3.5.1- 089	A,5
ASME Piping: Anchorage	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.T-24	3.5.1- 091	A
						III.B1.2.TP-226	3.5.1- 081	A
				Loss of Preload	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.TP-229	3.5.1- 087	A

Table 3.5.2-22 Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
ASME Piping: Anchorage	SS	Steel	Air – Outdoor (External)	Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.T-24	3.5.1- 091	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B1.2.T-25	3.5.1- 089	A,5
ASME Piping: Bolting (Structural)	SS	Stainless Steel	Treated Borated Water (External)	Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.TP-232	3.5.1- 085	A,4
					Water Chemistry (B2.1.2)	III.B1.2.TP-232	3.5.1- 085	A,4
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.T-24	3.5.1- 091	A
						III.B1.2.TP-226	3.5.1- 081	A
				Loss of Preload	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.TP-229	3.5.1- 087	A
			Air – Outdoor (External)	Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.TP-226	3.5.1- 081	A
				Loss of Preload	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.TP-229	3.5.1- 087	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B1.2.T-25	3.5.1- 089	A,5

Table 3.5.2-22 Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
ASME Piping: Sliding surfaces	SS	Lubrite; Fluorogold; Lubrofluor	Air – Indoor Uncontrolled (External)	Loss of Mechanical Function	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.TP-45	3.5.1- 075	A
ASME Piping: Spring hangers, guides and stops	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Mechanical Function	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.T-28	3.5.1- 057	A
			Air – Outdoor (External)	Loss of Mechanical Function	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.T-28	3.5.1- 057	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B1.2.T-25	3.5.1- 089	A,5
ASME Piping: Support members	SS	Stainless Steel	Treated Borated Water (External)	Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.TP-10	3.5.1- 090	A,4
					Water Chemistry (B2.1.2)	III.B1.1.TP-10	3.5.1- 090	A,4
		Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage (Only if CLB fatigue analysis exists)	TLAA	III.B1.2.T-26	3.5.1- 053	A
						III.B1.3.T-26	3.5.1- 053	A
				Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.T-24	3.5.1- 091	A
			Air – Outdoor (External)	Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.2.T-24	3.5.1- 091	A

Table 3.5.2-22 Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
ASME Piping: Support members	SS	Steel	Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B1.2.T-25	3.5.1- 089	A,5
Bolting (Structural)	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B2.TP-248	3.5.1- 080	A
						III.B3.TP-248	3.5.1- 080	A
						III.B4.TP-248	3.5.1- 080	A
						III.B5.TP-248	3.5.1- 080	A
				Loss of Preload	Structures Monitoring (B2.1.33)	III.B2.TP-261	3.5.1- 088	A
						III.B3.TP-261	3.5.1- 088	A
						III.B4.TP-261	3.5.1- 088	A
						III.B5.TP-261	3.5.1- 088	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B2.T-25	3.5.1- 089	A,1,5
						III.B3.T-25	3.5.1- 089	A,1,5
						III.B4.T-25	3.5.1- 089	A,1,5
						III.B5.T-25	3.5.1- 089	A,1,5
Conduit	SP	Aluminum	Air (External)	Loss of Material, Cracking	Structures Monitoring (B2.1.33)	III.B2.T-37b	3.5.1- 100	A
		PVC	Air – Indoor Uncontrolled (External)	None	None	VII.J.AP-268	3.3.1- 119	C

Table 3.5.2-22 Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Conduit	SP	PVC	Concrete (External)	None	None	VII.J.A-709	3.3.1- 184	C
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B2.TP-43	3.5.1- 092	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B2.TP-43	3.5.1- 092	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B2.T-25	3.5.1- 089	A,5
			Concrete (External)	None	None	VII.J.AP-282	3.3.1- 112	C
RCS Support: Anchorage	SS	High-Strength Steel	Air (External)	Cracking	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.TP-41	3.5.1- 068	A
		Stainless Steel	Air (External)	Cracking, Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.T-36b	3.5.1- 099	A
			Air with Borated Water Leakage (External)	None	None	III.B1.1.TP-4	3.5.1- 098	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.T-24	3.5.1- 091	A
						III.B1.1.TP-226	3.5.1- 081	A
				Loss of Preload	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.TP-229	3.5.1- 087	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B1.1.T-25	3.5.1- 089	A,5

Table 3.5.2-22 Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
RCS Support: Bolting (Structural)	SS	High-Strength Steel	Air (External)	Cracking	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.TP-41	3.5.1- 068	A
		Stainless Steel	Air (External)	Cracking, Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.T-36b	3.5.1- 099	A
			Air with Borated Water Leakage (External)	None	None	III.B1.1.TP-4	3.5.1- 098	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.T-24	3.5.1- 091	A
						III.B1.1.TP-226	3.5.1- 081	A
				Loss of Preload	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.TP-229	3.5.1- 087	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B1.1.T-25	3.5.1- 089	A,5
RCS Support: Sliding surfaces	SS	Lubrite; Fluorogold; Lubrofluor	Air – Indoor Uncontrolled (External)	Loss of Mechanical Function	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.TP-45	3.5.1- 075	A
RCS Support: Spring hangers, guides and stops	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Mechanical Function	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.T-28	3.5.1- 057	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B1.1.T-25	3.5.1- 089	A,5

Table 3.5.2-22 Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
RCS Support: Support members	SS	Steel	Air – Indoor Uncontrolled (External)	Cumulative Fatigue Damage (Only if CLB fatigue analysis exists)	TLAA	III.B1.1.T-26	3.5.1- 053	A
				Loss of Material	ASME Section XI, Subsection IWF (B2.1.30)	III.B1.1.T-24	3.5.1- 091	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B1.1.T-25	3.5.1- 089	A,5
Stainless Steel Elements	SS	Stainless Steel	Air (External)	Loss of Material, Cracking	Structures Monitoring (B2.1.33)	III.B2.T-37b	3.5.1- 100	A,3
						III.B3.T-37b	3.5.1- 100	A,3
						III.B4.T-37b	3.5.1- 100	A,3
						III.B5.T-37b	3.5.1- 100	A,3
			Air with Borated Water Leakage (External)	None	None	III.B2.TP-4	3.5.1- 098	A,3
						III.B3.TP-4	3.5.1- 098	A,3
						III.B4.TP-4	3.5.1- 098	A,3
						III.B5.TP-4	3.5.1- 098	A,3
Steel Elements	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B2.TP-43	3.5.1- 092	A,1
						III.B3.TP-43	3.5.1- 092	A,1
						III.B4.TP-43	3.5.1- 092	A,1

Table 3.5.2-22 Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Steel Elements	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B5.TP-43	3.5.1- 092	A,1
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B2.TP-43	3.5.1- 092	A,1
						III.B3.TP-43	3.5.1- 092	A,1
						III.B4.TP-43	3.5.1- 092	A,1
						III.B5.TP-43	3.5.1- 092	A,1
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B2.T-25	3.5.1- 089	A,1,5
						III.B3.T-25	3.5.1- 089	A,1,5
						III.B4.T-25	3.5.1- 089	A,1,5
						III.B5.T-25	3.5.1- 089	A,1,5
Wear Plate	SP	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B4.TP-43	3.5.1- 092	C
						None	None	H
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B4.T-25	3.5.1- 089	C,5

Table 3.5.2-22 Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Steel elements include support members, bearing plates, base plates, connections, instrument racks and structural frames.
2. Aluminum Elements include support members and cable trays.
3. Stainless Steel elements includes support members, bearing plates, base plates, connections, instrument racks and structural frames.
4. Subject component is the fuel transfer tube support.
5. Air with Borated Water Leakage Environment is for components in the Auxiliary Building, Reactor Building and Borated Water Storage Tank Superstructure.

Table 3.5.2-23 Containments, Structures, and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements	SS	Concrete	Air – Outdoor (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A,1
			Soil (External)	Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
Concrete Elements (Accessible)	SS	Concrete	Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A,1
			Groundwater/Soil (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-27	3.5.1- 065	A,1
			Water – Flowing (External)	Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A,1
Concrete Elements (Inaccessible)	SS	Concrete	Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
			Groundwater/Soil (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-204	3.5.1- 043	A,1
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-212	3.5.1- 065	A,1

Table 3.5.2-23 Containments, Structures, and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Concrete Elements (Inaccessible)	SS	Concrete	Groundwater/Soil (External)	Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-29	3.5.1- 067	A,1
				Loss of Material (Spalling, Scaling), Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-108	3.5.1- 042	A,1
			Soil (External)	Cracking, Distortion	Structures Monitoring (B2.1.33)	III.A3.TP-30	3.5.1- 044	A,1
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-67	3.5.1- 047	A,1
Drains/ Curbs	DF	Concrete	Air – Indoor Uncontrolled (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A
				Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A
				Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-28	3.5.1- 067	A
			Air – Outdoor (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A

Table 3.5.2-23 Containments, Structures, and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Drains/ Curbs	DF	Concrete	Air – Outdoor (External)	Cracking, Loss of Bond, Loss of Material (Spalling, Scaling)	Structures Monitoring (B2.1.33)	III.A3.TP-26	3.5.1- 066	A
			Water – Flowing (External)	Cracking	Structures Monitoring (B2.1.33)	III.A3.TP-25	3.5.1- 054	A
				Increase in Porosity and Permeability, Loss of Strength	Structures Monitoring (B2.1.33)	III.A3.TP-24	3.5.1- 063	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	C
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	C
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B2.T-25	3.5.1- 089	A,5
Electrical Enclosure	SP; SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B3.TP-43	3.5.1- 092	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.B3.TP-43	3.5.1- 092	A
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B3.T-25	3.5.1- 089	A,5
Fire Barriers - Penetration Seals	FB	Cerafiber Bulk, Cerafiber Blanket, Cerafoam, Pyrocrete, Mineral Wool, 3M Putty	Air (External)	Loss of Material, Cracking or Delamination, Change in Material Properties, Separation	Fire Protection (B2.1.15)	VII.G.A-807	3.3.1- 269	A

Table 3.5.2-23 Containments, Structures, and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Fire Barriers - Penetration Seals	FB	Elastomer, Rubber and Other Similar Materials	Air (External)	Hardening, loss of strength, or shrinkage	Fire Protection (B2.1.15)	VII.G.A-19	3.3.1- 057	A
		Grout	Air (External)	Cracking, Loss of Material	Fire Protection (B2.1.15)	VII.G.A-90	3.3.1- 060	A
					Structures Monitoring (B2.1.33)	VII.G.A-90	3.3.1- 060	A
Grout	SS	Grout	Air – Indoor Uncontrolled (External)	Reduction in Concrete Anchor Capacity	Structures Monitoring (B2.1.33)	III.B1.1.TP-42	3.5.1- 055	A
						III.B1.2.TP-42	3.5.1- 055	A
						III.B2.TP-42	3.5.1- 055	A
						III.B3.TP-42	3.5.1- 055	A
						III.B4.TP-42	3.5.1- 055	A
						III.B5.TP-42	3.5.1- 055	A
			Air – Outdoor (External)	Reduction in Concrete Anchor Capacity	Structures Monitoring (B2.1.33)	III.B1.2.TP-42	3.5.1- 055	A
						III.B2.TP-42	3.5.1- 055	A
						III.B3.TP-42	3.5.1- 055	A
						III.B4.TP-42	3.5.1- 055	A
						III.B5.TP-42	3.5.1- 055	A

Table 3.5.2-23 Containments, Structures, and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes
Penetration Seals	FLD	Elastomer, Rubber and Other Similar Materials	Air – Indoor Uncontrolled (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
Penetration Sleeve	SS	Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A,4
			Air with Borated Water Leakage (External)	Loss of Material	Boric Acid Corrosion (B2.1.4)	III.B4.T-25	3.5.1- 089	A,5
Piles	SS	Steel	Groundwater/Soil (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-219	3.5.1- 079	C,2,3
Seismic Gap Cover	SP	Elastomer, Rubber and Other Similar Materials	Air – Indoor Uncontrolled (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
			Air – Outdoor (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
		Steel	Air – Indoor Uncontrolled (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
			Air – Outdoor (External)	Loss of Material	Structures Monitoring (B2.1.33)	III.A3.TP-302	3.5.1- 077	A
Seismic Gap Filler Material	FB; SP	Cork	Air – Indoor Uncontrolled (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	None	None	F
		Elastomer	Air – Indoor Uncontrolled (External)	Loss of Sealing	Structures Monitoring (B2.1.33)	III.A6.TP-7	3.5.1- 072	A
Vibration Isolator	SS	Non-Metallic (e.g., Rubber)	Air – Indoor Uncontrolled (External)	Reduction or Loss of Isolation Function	Structures Monitoring (B2.1.33)	III.B4.TP-44	3.5.1- 094	A

Table 3.5.2-23 Containments, Structures, and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect	Aging Management Program	NUREG-2191 Item	NUREG-2192 Table 1	Notes

Plant Specific Notes:

1. Concrete Elements include Yard Structure Foundations, Valve Pits and Transformer Epuipment Pads.
2. Sheet piles are aligned to III.A3.TP-219, since metal piles do not appear in GALL Tables for Group 6 Structures.
3. Piles include the foundation dowels, pipe piles and piles.
4. Penetration sleeves includes louvers.
5. Air with Borated Water Leakage Environment is for components in the Auxiliary Building, Reactor Building and Borated Water Storage Tank Superstructure.

Tables 3.5.2-1 through 3.5.2-23 Industry Standard Notes:

A. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

B. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-2191 AMP.

C. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

D. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP takes some exceptions to the NUREG-2191 AMP.

E. Consistent with NUREG-2191 item for material, environment, and aging effect, but a different AMP is credited or NUREG-2191 identifies a plant-specific AMP.

F. Material not in NUREG-2191 for this component.

G. Environment not in NUREG-2191 for this component and material.

H. Aging effect not in NUREG-2191 for this component, material, and environment combination.

I. Aging effect in NUREG-2191 for this component, material, and environment combination is not applicable.

J. Neither the component nor the material and environment combination are evaluated in NUREG-2191.

3.6 AGING MANAGEMENT OF ELECTRICAL AND INSTRUMENTATION AND CONTROLS

3.6.1 INTRODUCTION

This section provides the results of the AMR for components and commodities identified in Section 2.5.1, Electrical and Instrumentation and Control Component Commodity Groups as being subject to AMR. Components and commodities addressed in this section are described in the indicated sections.

- Cable and Connections (Section 2.5.1.1)
- Fuse Holders (Not Part of Active Equipment) (Section 2.5.1.2)
- Metal Enclosed Bus (Section 2.5.1.3)
- Switchyard Bus and Connections (Section 2.5.1.4)
- Transmission Conductors and Connections (Section 2.5.1.5)
- High Voltage Insulators (Section 2.5.1.6)

3.6.2 RESULTS

- Table 3.6.2-1, Electrical and Instrumentation and Controls - Electrical and Instrumentation and Controls Commodities - Aging Management Evaluation

3.6.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.6.2.1.1 Cables Connections (Metallic Parts)

Materials

Components in the cables connections (metallic parts) are constructed of the following materials:

- Various Metals Used for Electrical Contacts

Environments

Components in the cables connections (metallic parts) are exposed to the following environments:

- Air - Indoor, Controlled
- Air - Indoor Uncontrolled
- Air - Outdoor

Aging Effects Requiring Management

Components in cables connections (metallic parts) require aging management to address the following aging effects:

- Increased Electrical Resistance of Connection

Aging Management Programs

The aging effects for components in cables connections (metallic parts) are managed by the following AMPs:

- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.43)

3.6.2.1.2 Connector Contacts for Electrical Connections Exposed to Borated Water

Materials

Components in the connector contacts for electrical connections exposed to borated water are constructed of the following materials:

- Various Metals Used for Electrical Contacts

Environments

Components in the connector contacts for electrical connections exposed to borated water are exposed to the following environments:

- Air with Borated Water Leakage

Aging Effects Requiring Management

Components in connector contacts for electrical connections exposed to borated water require aging management to address the following aging effects:

- Increased Electrical Resistance of Connection Due to Corrosion of Connector Contact Surfaces Caused by Intrusion of Borated Water

Aging Management Programs

The aging effects for components in connector contacts for electrical connections exposed to borated water are managed by the following AMPs:

- Boric Acid Corrosion (B2.1.4)

3.6.2.1.3 Insulation for Electrical Cables and Connections

Materials

The insulation for electrical cables and connections are constructed of the following materials:

- Various Organic Polymers

Environments

The insulation for electrical cables and connections are exposed to the following environments:

- Adverse Localized Environment
- Adverse Localized Environment Caused by Significant Moisture

Aging Effects Requiring Management

The insulation for electrical cables and connections require aging management to address the following aging effects:

- Degraded Dielectric Strength
- Reduced Electrical Insulation Resistance

Aging Management Programs

The aging effects for insulation for electrical cables and connections are managed by the following AMPs:

- Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.36)
- Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B2.1.37)
- Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.39)
- Electrical Insulation for Inaccessible Low Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.40)

- Electrical Insulation for Inaccessible Medium Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.38)

3.6.2.1.4 Fuse Holders (Not Part of Active Equipment): Insulation Material

Materials

Components in the fuse holders (not part of active equipment) insulation material are constructed of the following materials:

- Bakelite
- Ceramic
- Molded Polycarbonate
- Other Organic Polymers
- Phenolic Melamine

Environments

Components in the fuse holders (not part of active equipment) insulation material are exposed to the following environments:

- Air - Indoor Controlled
- Air - Indoor Uncontrolled

Aging Effects Requiring Management

Components in fuse holders (not part of active equipment) insulation material require aging management to address the following aging effects:

- Reduced Electrical Insulation Resistance

Aging Management Programs

The aging effects for components in fuse holders (not part of active equipment) insulation material are managed by the following AMPs:

- Fuse Holders (B2.1.42)

3.6.2.1.5 Fuse Holders (Not Part of Active Equipment): Metallic Clamps

Materials

Components in the fuse holders (not part of active equipment) metallic clamps are constructed of the following materials:

- Various Metals Used for Electrical Connections

Environments

Components in the fuse holders (not part of active equipment) metallic clamps are exposed to the following environments:

- Air - Indoor Controlled
- Air - Indoor Uncontrolled

Aging Effects Requiring Management

Components in fuse holders (not part of active equipment) metallic clamps require aging management to address the following aging effects:

- Increased Electrical Resistance of Connection

Aging Management Programs

The aging effects for components in fuse holders (not part of active equipment) are managed by the following AMPs:

- Fuse Holders (B2.1.42)

3.6.2.1.6 Metal Enclosed Bus

Materials

Components in the metal enclosed bus are constructed of the following materials:

- Galvanized Steel, Aluminum
- Porcelain
- Various Metals Used for Electrical Bus and Connections
- Various Organic Polymers

Environments

Components in the metal enclosed bus are exposed to the following environments:

- Air - Indoor Controlled
- Air - Indoor Uncontrolled
- Air - Outdoor

Aging Effects Requiring Management

Components in metal enclosed bus require aging management to address the following aging effects:

- Elastomer Hardening or Loss of Strength
- Increased Electrical Resistance of Connection
- Loss of Material
- Reduced Electrical Insulation Resistance

Aging Management Programs

The aging effects for components in metal enclosed bus are managed by the following AMPs:

- Metal Enclosed Bus (B2.1.41)
- Structures Monitoring (B2.1.33)

3.6.2.1.7 Switchyard Bus and Connections

Materials

Components in the switchyard bus and connections are constructed of the following materials:

- Aluminum
- Bronze
- Copper
- Galvanized Steel
- Stainless Steel

Environments

Components in the switchyard bus and connections are exposed to the following environments:

- Air - Outdoor

Aging Effects Requiring Management

Components in switchyard bus and connections have no aging effects requiring aging management.

Aging Management Programs

Because there are no aging effects requiring aging management, no AMPs are required for switchyard bus and connections.

3.6.2.1.8 Transmission Conductors and Connections

Materials

Components in the transmission conductors and connections are constructed of the following materials:

- Aluminum
- Aluminum, Steel

Environments

Components in the transmission conductors and connections are exposed to the following environments:

- Air - Outdoor

Aging Effects Requiring Management

Components in transmission conductors and connections have no aging effects requiring aging management.

Aging Management Programs

Because there are no aging effects requiring aging management, no AMPs are required for transmission conductors and connections.

3.6.2.1.9 High Voltage Insulators

Materials

Components in the high voltage insulators are constructed of the following materials:

- Aluminum
- Cement
- Galvanized Steel
- Malleable Iron
- Porcelain

Environments

Components in the high voltage insulators are exposed to the following environments:

- Air - Outdoor

Aging Effects Requiring Management

Components in high voltage insulators have no aging effects requiring aging management.

Aging Management Programs

Because there are no aging effects requiring aging management, no AMPs are required for high voltage insulators.

3.6.2.2 Further Evaluation of Aging Management as Recommended by NUREG-2192

NUREG-2192 provides the bases for identifying those programs that warrant further evaluation by the reviewer in the SLRA. For electrical and I&C, those evaluations are addressed in the following sections.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

NUREG-2192

Environmental qualification is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed separately in Section 4.4, "Environmental Qualification (EQ) of Electrical Equipment," of this SRP-SLR.

Evaluation

[3.6.1-001] - Environmental qualification is a TLAA as defined in 10 CFR 54.3. The evaluation of this TLAA is addressed in Section 4.4, "Environmental Qualification of Electric Equipment".

3.6.2.2.2 Reduced Insulation Resistance Due to Age Degradation of Cable Bus Arrangements Caused by Intrusion of Moisture, Dust, Industrial Pollution, Rain, Ice, Photolysis, Ohmic Heating and Loss of Strength of Support Structures and Louvers of Cable Bus Arrangements Due to General Corrosion and Exposure to Air Outdoor

NUREG-2192

Reduced insulation resistance due to age degradation of cable bus caused by intrusion of moisture, dust, industrial pollution, rain, ice, photolysis (for ultraviolet sensitive material only), ohmic heating and loss of strength of support structures, covers or louvers of cable bus arrangements due to general corrosion or exposure to air outdoor could occur in cable bus assemblies. Cable bus is a variation of metal enclosed bus (MEB) which is similar in construction to an MEB, but instead of segregated or nonsegregated electrical buses, cable bus is comprised of a fully enclosed metal enclosure that utilizes three-phase insulated power cables installed on insulated support blocks. Cable bus may omit the top cover or use a louvered top cover and enclosure. Both the cable bus and enclosures are not sealed against intrusion of dust, industrial pollution, moisture, rain, and ice and therefore may introduce debris into the internal cable bus assembly.

Consequently, cable bus construction and arrangements are such that it may not readily fall under a specific GALL-SLR Report AMP (e.g., GALL-SLR Report AMP XI.E1 and AMP XI.E4). GALL-SLR Report AMP XI.E1 calls for a visual inspection of accessible insulated cables and connections subject to an adverse localized environment which may not be applicable to cable bus due to inaccessibility or applicability of the aging mechanisms and effects. GALL-SLR Report

AMP XI.E4 includes tests and inspections of the internal and external portions of the MEB. The MEB internal and external inspections and tests may not be applicable to cable bus aging mechanisms and effects. Therefore, the GALL-SLR Report recommends cable bus aging mechanisms and effects be evaluated as a plant-specific further evaluation. The evaluation includes associated AMPs: AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," and AMP XI.S6, "Structures Monitoring." Acceptance criteria are described in Branch Technical Position (BTP) RLSB-1 (Appendix A.1 of this SRP-SLR).

Evaluation

[3.6.1-029], [3.6.1-030], [3.6.1-031] - UFSAR Section 8.3.1.4 identifies cable bus as being installed by the protected service water project, the 13.8 kV protected service water Keowee power feeder switchgear line side cable bus. Power cable bus is a manufacturer-designed engineered system that consists of single-conductor cables installed in a metallic enclosure with conductor spacing devices that are integral to the cable bus. These conductor spacing devices physically separate and electrically isolate each cable using insulated support blocks. The Keowee power feeder switchgear line side cable bus is not true power cable bus, but rather an enclosed cable tray design with three phase conductors braced together by cleats in a triangular configuration. The safety-function of the cleats is to eliminate the hazard of cable whip during a fault downstream of the transition junction boxes. These cable cleats are constructed of stainless steel, with a Low-Smoke/Low-Fume cushioning pad that is used to protect the cables prior to closing the cable cleat locking tang. This Low-Smoke/Low-Fume pad has no electrical function and failure of the Low-Smoke/Low-Fume pad after installation will not prevent the cable cleat from bracing the cable. The cleat to tray hardware and cleat locking tang are secured with stainless-steel hardware using good bolting practices that includes locking nuts. There is therefore no aging management required for the cable cleat.

Aging management of the cables is implemented under the *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Aging Management* program (B2.1.36), whereas aging management of the cable tray and associated hardware is accomplished using the *Structures Monitoring* program (B2.1.33). These aging management programs provide reasonable assurance that aging effects of the 13.8 kV protected service water Keowee power feeder switchgear line side cable bus are adequately managed, such that no plant specific program is required.

3.6.2.2.3 Loss of Material Due to Wind-Induced Abrasion, Loss of Conductor Strength Due to Corrosion, and Increased Resistance of Connection Due to Oxidation or Loss of Preload for Transmission Conductors, Switchyard Bus, and Connections

NUREG-2192

Loss of material due to wind-induced abrasion, loss of conductor strength due to corrosion, and increased resistance of connection due to oxidation or loss of preload could occur in transmission conductors and connections, and in switchyard bus and connections. The GALL-SLR Report recommends further evaluation of a plant-specific AMP to demonstrate that this *aging effect is adequately managed. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).*

Evaluation

The transmission conductors, transmission connectors, and switchyard bus and connections evaluated for ONS are those that are part of the circuits which supply power from the electric utility transmission system to plant buses, including connecting the alternate ac source in the event of a station blackout. These circuits provide power to in-scope license renewal components used for coping during and recovery from a station blackout event and during post fire safe shutdown, when offsite power is credited.

The in-scope commodities in the circuits for offsite power sources and the station blackout alternate ac source include 230 kV and 100 kV transmission conductors and connections; which include aluminum conductor, steel reinforced transmission conductors and drop lines connected to the station startup transformers.

Wind-Induced Abrasion and Fatigue – Transmission Conductors

[3.6.1-007] – Aluminum Conductor Steel Reinforced and Aluminum Transmission Conductors: Transmission conductor vibration or sway could be caused by wind loading. Industry experience has shown that the transmission conductors do not normally swing significantly, and when they do swing due to a substantial wind, they do not continue to swing for very long once the wind has subsided. For most ONS transmission conductors, wind loading that can cause a transmission line to vibrate or sway is adequately addressed in design and installation, such that abrasion/ fatigue that could result from wind-induced transmission conductor vibration or sway is not applicable and would not cause a loss of intended function for transmission conductors for the SPEO.

ONS operating experience includes the failure of aluminum conductor steel reinforced transformer conductors/terminations to startup transformer CT3. The ONS startup transformer lines consist of 4/0 aluminum conductor steel reinforced cable with a 0.556 inch diameter, which is substantially smaller than the cable size typical of today's standards for 230 kV operation. While this smaller cable is capable of carrying the required ampacity of the startup transformer, the causal evaluation for this failure determined wind-induced (aeolian) vibrations of these smaller conductors can produce damage that will negatively impact the reliability of these lines. The causal evaluation further determined that vulnerability to this aging mechanism at ONS is limited to the overhead transmission conductors and drop lines to startup transformers CT1, CT2, and CT3. The corrective action arising from this failure resulted in a preventive maintenance activity to replace the aluminum conductor steel reinforced transmission conductors and drop lines to all three startup transformers on a 10 year frequency. Given that these conductors are now replaced on a specified frequency, they are considered short-lived, such that no further aging management is required.

Corrosion – Transmission Conductors

[3.6.1-004] - All transmission conductors under the scope of 10 CFR 54.4 at ONS are aluminum conductor steel reinforced, or all aluminum conductor. The aluminum conductor steel reinforced conductor size ranges from 4/0 to 2156 MCM, and the all aluminum conductor size is 2000 MCM. The most prevalent mechanism contributing to loss of conductor strength of an aluminum conductor steel reinforced transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. For aluminum conductor steel reinforced conductors, degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion rates depend largely on air quality, which includes suspended particles chemistry, SO_2 concentration in air, precipitation, fog chemistry and meteorological conditions. Tests performed by Ontario Hydroelectric showed a 30% loss of composite conductor strength of an 80 year old aluminum conductor steel reinforced conductor due to corrosion.

There is set percentage of composite conductor strength established at which a transmission conductor is replaced. As illustrated below, there is ample strength margin to maintain the transmission conductor intended function through the SPEO.

The National Electrical Safety Code requires that tension on installed conductors be a maximum of 60% of the ultimate conductor strength. The National Electrical Safety Code also sets the maximum tension a conductor must be designed to withstand under heavy load requirements, which includes consideration of ice, wind and temperature. These requirements are reviewed concerning the specific conductors included in the AMR. The conductors with the smallest ultimate strength margin are 4/0 aluminum conductor steel reinforced and will be used as an illustration.

The ultimate strength and the National Electrical Safety Code heavy load tension requirements of 4/0 aluminum conductor steel reinforced are 8350 lbs. and 2761 lbs. respectively. The margin between the National Electrical Safety Code heavy load and the ultimate strength is 5589 lb.; i.e., there is a 67% of ultimate strength margin. The Ontario Hydroelectric study showed a 30% loss of composite conductor strength in an 80 year old conductor. In the case of the 4/0 aluminum conductor steel reinforced transmission conductors, a 30% loss of ultimate strength would mean that there would still be a 37% ultimate strength margin between what is required by the National Electrical Safety Code and the actual conductor strength.

The 4/0 aluminum conductor steel reinforced conductors have the lowest initial design margin of transmission conductors included in the AMR. Corrosion of aluminum conductor steel reinforced conductors is a very slow acting aging effect that is even slower for rural areas, such as ONS, with generally less suspended particles and SO_2 concentrations in the air than urban areas. Therefore the environmental impact to the ONS transmission conductors (which are located in a rural area) are bounded by the Ontario Hydroelectric conductors (which were located in polluted and urban environments). This illustrates with reasonable assurance the aluminum conductor steel reinforced transmission conductors will have ample strength through the SPEO.

All aluminum conductors are not subject to the aging effect of loss of conductor strength due to corrosion. Therefore, the all aluminum conductors transmission conductors that are within the scope of 10 CFR 54.4 do not require aging management for loss of conductor strength due to corrosion.

In conclusion, the in-scope ONS aluminum conductor steel reinforced transmission conductors that must be reviewed for susceptibility to loss of conductor strength due to corrosion are bounded by the Ontario Hydroelectric study by test methodology, design and construction, and environment. In-scope all aluminum conductors do not experience loss of conductor strength due to corrosion per NUREG-2191. The above evaluations demonstrate with reasonable assurance that transmission conductors will have ample strength margin through the SPEO. Therefore, based on ONS design and confirmed by their OE, the loss of transmission conductor strength does not require aging management activities for the SPEO.

Oxidation or Loss of Preload – Transmission Connectors

[3.6.1-005] - Transmission Connectors: Transmission connectors employ good bolting practices. The connections are treated with corrosion inhibitors to avoid connection oxidation and torqued at the time of installation to avoid loss of preload. The transmission connectors are designed and installed using stainless steel lock washers that provide vibration absorption and prevent loss of preload. Therefore, based on ONS design and confirmed by operating experience, oxidation and loss of preload are not applicable aging mechanisms for ONS transmission connectors.

Wind-Induced Abrasion and Fatigue – Switchyard Bus

[3.6.1-006] – Switchyard Bus and Connections: Switchyard buses are connected to flexible conductors that do not normally vibrate and are supported by insulators and ultimately by static, structural components, such as concrete footings and structural steel. Switchyard bus is rigidly mounted and is therefore not subject to abrasion induced by wind loading. Therefore, based on ONS design and confirmed by operating experience, wind-induced abrasion and fatigue are not applicable aging mechanisms for ONS switchyard bus.

Oxidation or Loss of Pre-Load – Switchyard Bus Connections

[3.6.1-006] – Switchyard bus is used to provide an electrically common connection point for disconnect switches and flexible conductors. Since the connections to disconnect switches are maintained as part of the switch, switchyard bus connections to disconnect switches are considered part of the disconnect switch. Bolted flexible connections to the switchyard bus are part of the transmission connectors [3.6.1-005]. All rigid switchyard bus connections are welded connections. Therefore, based on ONS design and confirmed by operating experience, oxidation and loss of preload are not applicable aging mechanisms for ONS switchyard bus connections.

Conclusion

Aging management activities for ONS transmission conductors and transmission connections, switchyard bus and connections are not required for the SPEO. Overhead aluminum conductor steel reinforced transmission conductors and drop lines to startup transformers CT1, CT2, and CT3 are periodically replaced, and therefore short lived.

3.6.2.2.4 Quality Assurance for Aging Management of Non-Safety Related Components

NUREG-2192

Acceptance criteria are described in BTP IQMB-1 (Appendix A.2 of this SRP-SLR).

Evaluation

Quality Assurance provisions applicable to SLR are discussed in Appendix B1.3, Quality Assurance Program and Administrative Controls.

3.6.2.2.5 Ongoing Review of Operating Experience

NUREG-2192

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

Evaluation

The OE process and acceptance criteria are described in Appendix B1.4, Operating Experience.

3.6.2.3 Aging Management Review Results Not Consistent With or Not Addressed in the Generic Aging Lessons Learned for Subsequent License Renewal Report

3.6.2.3.1 High Voltage Electrical Insulators

The high voltage electrical insulators included in the scope of SLR are associated with the QA-1 onsite and non-QA offsite power source circuits and the alternate AC power sources required to cope with SBO or SBO recovery path.

The overhead QA-1 onsite power path provides emergency power from Keowee hydro to the 230 kV switchyard yellow bus.

Per NUREG-2192 Section 2.5.2.1.1, *Components Within the Scope of SBO (10 CFR 50.63)*, the SBO recovery path is defined as:

> *The plant system portion of the offsite power system that is used to connect the plant to the offsite power source meeting the requirements under 10 CFR 54.4(a)(3). The electrical distribution equipment out to the first circuit breaker with the offsite distribution system (i.e., equipment in the switchyard). This path typically includes the circuit breakers*

that connect to the offsite system power transformers (startup transformers), the transformers themselves, the intervening overhead or underground circuits between circuit breaker and transformer and transformer and onsite electrical distribution system, and the associated control circuits and structures. However, the NRC staff's review is based on the plant-specific CLB, regulatory requirements, and offsite power design configurations.

The ONS primary transmission system consists of 230 kV and 525 kV loop networks with corresponding onsite 230 kV (Unit 1 and 2) and 525 kV (Unit 3) switchyards.

When there is inadequate power from the generating units, the 230 kV switchyard and the Keowee hydro units, power is available to the plant standby power buses either directly from the 100 kV Central Tie substation or from Lee Steam Station via a 100 kV transmission line connected to 100/4 kV transformer CT5 located at ONS. If an emergency occurs that would require the use of the 100 kV transmission system, this line can either be isolated from the balance of the transmission system to supply emergency power directly to ONS from Lee Steam Station, or emergency power can be supplied directly from the 100 kV system from the Central Tie Substation to ONS.

Each ONS unit has a startup circuit that connects the 230 kV switchyard yellow bus to 4 kV main feeder buses 1 and 2 through unit startup transformers CT1, CT2 and CT3. The 230 kV startup circuits each include a breaker-and-a-half design consisting of three power circuit breakers. The startup transformers have 4 kV and 7 kV secondary windings. The 4 kV windings are connected to main feeder buses via switchgear breakers. The 7 kV windings power reactor coolant pumps and thus are not associated with the SBO recovery path.

In addition, the main feeder buses for each unit can also be energized from a 100 kV offsite circuit to onsite transformer CT5 which provides 4 kV power via insulated cable to the standby buses which can be aligned to power the main feeder buses. CT5 is fed from 100 kV oil circuit breaker OCB-101.

The in-scope high voltage insulators associated with the QA-1 onsite overhead power path are:

- 230 kV post and strain insulators from Keowee hydro via the overhead power path to PCB-9
- 230 kV post and strain insulators associated with PCBs-8, 12, 15, 17, 21, 24, 26, 28, and 33. These PCBs are required to trip and/or close to isolate the switchyard and align the overhead path from Keowee hydro to the 230 kV switchyard yellow bus.
- 230 kV post and strain insulators associated with the 230 kV switchyard yellow bus.

The in-scope high voltage insulators associated with the offsite SBO recovery paths are:

- 230 kV post and strain insulators from PCB-17 and PCB-18 to start-up transformer CT1
- 230 kV post and strain insulators from PCB-26 and PCB-27 to start-up transformer CT2

- 230 kV post and strain insulators from PCB-28 and PCB-30 to start-up transformer CT3
- 100 kV and 4.16 kV post and strain insulators from OCB-101 to transformer CT5

The in-scope high voltage insulators provide electrical insulation for switchyard bus, transmission conductors, switchyard active components, and associated connections that are part of the circuits that supply power from the offsite power distribution system electric utility transmission system to plant buses, including connecting the alternate AC source in the event of an SBO. These circuits provide power to in-scope SLR components used for coping during and recovery from an SBO event and during post fire safe shutdown when offsite power is credited.

Airborne Contamination

Various airborne materials such as salt, dust, fog, cooling tower plume, foreign debris, or industrial effluents can contaminate insulator surfaces. An excessive buildup of surface contamination enables the conductor voltage to track along the insulator surface more easily and can lead to insulator flashover. The buildup of surface contamination is gradual and typically such contamination is washed away by normal rain action aided by the glazed insulator surface.

Excessive surface contamination can be a problem in areas where there are greater concentrations of airborne particles such as near the seacoast where salt spray is prevalent, dust, near industrial facilities that discharge airborne pollutants, or at sites where the cooling tower plume may deposit contaminants on switchyard components and transmission lines.

At ONS, the in-scope 230 kV and 4.16 kV post and strain insulators were evaluated for susceptibility to airborne surface contamination from salt, dust, fog, cooling tower plume, foreign debris, and industrial effluents. ONS is not situated in an environment conducive to accelerated aging.

ONS is located in the upstate of South Carolina in a predominantly rural wooded area where salt and dust contamination, and wind-driven particles are not high voltage insulator aging factors. Fog alone is not considered a high voltage insulator contaminant since it eventually evaporates as temperatures rise above the dewpoint for fog formation. ONS has no cooling towers and uses freshwater Lake Keowee for cooling and ultimate heat sink and thus cooling tower plumes are not present. There are no nearby heavy industries, mining, factories, agriculture or other facilities emitting significant foreign debris or industrial effluent that could promote high voltage insulator aging effects. There are no past or existing preventive measures that perform routine insulator cleaning.

A ten-year review of operating experience for in-scope high voltage insulators was performed. Accumulation of high voltage insulator contamination or insulator flashover has not been experienced at ONS. Existing maintenance procedures include inspections for insulator contamination, corrosion and other forms of degradation or damage.

A review was performed with respect to applicability to ONS of the draft Interim Staff Guidance SLR-ISG-Electrical -2021-04 Electrical Appendix D (Proposed Revisions to AMP XI.E7, “High-

Voltage Insulators”). As part of the review, walkdowns and discussions were conducted with personnel responsible for the switchyards to determine if there were any in-scope polymer or toughened-glass type insulators, past history of excessive insulator contamination or flashover, or other high voltage insulator age-related issues. These walkdowns confirmed that there are no in-scope polymer or toughened-glass type insulators, past history of excessive insulator contamination, flashover, or other high voltage insulator aging issues. Additionally, high voltage insulator cleaning due to contamination has never been determined to be necessary at ONS.

Based on the location of ONS, lack of substantial airborne contaminants, corroborating operating experience, excessive high voltage insulator surface contamination is not expected to occur. Therefore, aging effects of surface contamination from salt, dust, fog, cooling tower plume, foreign debris, and industrial effluents are not applicable to ONS for the SPEO. No aging management activity is required for the in-scope high voltage insulators due to airborne contamination.

In addition, an evaluation was performed for high voltage insulator porcelain cracking. Porcelain cracking or breaking is commonly caused by an object striking the high voltage insulator or cement growth. Porcelain cracking due to external forces is not in the scope of high voltage insulator aging management. Cement growth occurs due to improper manufacturing that results in excessive expansion of the cement binding the insulator components. This expansion makes the cement more susceptible to moisture intrusion. ONS OE indicates that cement growth induced porcelain cracking has not occurred. Therefore, high voltage insulator porcelain cracking caused by physical damage is not an aging effect, is not subject to an AMR, and does not require aging management.

Loss of Material – Mechanical Wear or Corrosion

High voltage insulator loss of material can occur due to the oscillating movement of transmission conductors due to significant and sustained winds. These wind conditions can result in mechanical wear of metallic parts. Surface corrosion of high voltage insulator metallic parts can also occur due to environmental contamination or if galvanized or other protective coatings are worn from significant wind induced movement of transmission conductors.

Mechanical wear is an aging effect for strain insulators when they are subject to excessive movement. Movement can be caused by wind blowing the supported transmission conductor causing swinging. If this swinging is frequent and severe enough, wear could be caused on the metal contact points of the insulator string.

Although transmission conductor swing is possible, ONS experience has shown that swinging is atypical. When persistent and substantial wind conditions induce conductor swing, after the winds subside the swing ceases. Mechanical wear of high voltage insulator strain insulator metallic components has not been identified during routine inspections at ONS or plant specific OE review.

Loss of material due to high voltage insulator corrosion can also occur due to airborne contamination. A large buildup of contamination could result in corrosion of the high voltage insulator metallic parts, which if significant, could eventually impact the structural intended function. However, as previously stated, based on the ONS location, lack of airborne contaminants including salt or industrial effluent and corroborating operating experience, high voltage insulator metallic parts are not subject to a significant buildup of contamination from airborne contaminants.

High voltage insulator mechanical wear due to wind induced transmission conductor movement and corrosion is not a significant aging effect at ONS and does not require aging management for the SPEO.

Conclusion:

Airborne contamination (including wind-driven particles) and loss of material due to mechanical wear and corrosion are not significant aging affects at ONS. Aging management activities for high voltage insulators are not required. Therefore, the GALL-SLR report XI.E7 High Voltage Insulators AMP is not required.

The electrical commodities that are subject to AMR have been identified in accordance with the requirements of 10 CFR 54.4. The AMPs selected to manage aging effects for the electrical commodities are identified in the summaries in Section 3.6.2.1 above. A description of the AMPs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the SPEO. Based on the conclusions provided in Appendix B, the effects of aging associated with the electrical commodities will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the CLB during the SPEO.

Results Tables: Electrical and Instrumentation and Controls Commodity Groups

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-001	Electrical equipment subject to 10 CFR 50.49 EQ requirements composed of various polymeric and metallic materials in plant areas subject to a harsh environment (i.e., loss of coolant accident (LOCA), high energy line break (HELB), or post LOCA environment or; An adverse localized environment for the most limiting qualified condition for temperature, radiation, or moisture for the component material (e.g., cable or connection insulation).	Various aging effects due to various mechanisms in accordance with 10 CFR 50.49.	EQ is a time-limited aging analysis (TLAA) to be evaluated for the SPEO. See the Standard Review Plan, Section 4.4, "Environmental Qualification (EQ) of Electric Equipment," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). See AMP X.E1, "Environmental Qualification (EQ) of Electric Equipment," of this report for meeting the requirements of 10 CFR 54.21(c)(1)(i)-(iii).	Yes, TLAA (SRP-SLR Section 3.6.2.2.1).	Consistent with NUREG-2191. EQ is a TLAA; The evaluation of this TLAA is addressed in Section 4.4. See further evaluation in Section 3.6.2.2.1.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-002	High-voltage electrical insulators composed of porcelain; malleable iron; aluminum; galvanized steel; cement; toughened glass; polymers; silicone rubber; fiber glass, aluminum alloy exposed to air – outdoor	Loss of material due to mechanical wear caused by movement of transmission conductors due to significant wind, and wind-driven particles impacting surfaces	AMP XI.E7, "High-Voltage Insulators"	No	Not applicable. Based on ONS design and operating experience, loss of material is not an applicable aging effect for high voltage electrical insulators in Electrical Commodities. In-scope high voltage insulators comprised of porcelain, malleable iron, aluminum, galvanized steel, and cement in an air - outdoor environment are not subject to loss of material due to mechanical wear or corrosion caused by movement of transmission conductors due to significant wind. See Section 3.6.2.3.1. The associated NUREG-2191 aging items are not used.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-003	High-voltage insulators composed of porcelain; malleable iron; aluminum; galvanized steel; cement; toughened glass; polymers; silicone rubber; fiber glass, aluminum alloy exposed to air – outdoor	Reduced electrical insulation resistance due to presence of salt deposits, surface contamination, or peeling of silicone rubber sleeves for polymer insulators	AMP XI.E7, "High-Voltage Insulators"	No	Not applicable. Based on ONS geographic location, design, and operating experience, reduced insulation resistance is not an applicable aging effect for high voltage electrical insulators in Electrical Commodities. In scope high voltage electrical insulators comprised of porcelain, malleable iron, aluminum, galvanized steel, and cement in an air - outdoor environment are not subject to reduced electrical insulation resistance due to presence of cracks, foreign debris, salt, dust, cooling tower plume, or industrial effluent contamination. See Section 3.6.2.3. The associated NUREG-2191 aging items are not used.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-004	Transmission conductors composed of aluminum; steel exposed to air - outdoor	Loss of conductor strength due to corrosion	A plant-specific AMP is to be evaluated for ACSR	Yes (SRP-SLR Section 3.6.2.2.3)	Not applicable. Site evaluations demonstrate with reasonable assurance that transmission conductors will have ample strength margin through the second period of extended operation. See further evaluation in Section 3.6.2.2.3. The associated NUREG-2191 aging items are not used.
3.6.1-005	Transmission connectors composed of aluminum; steel exposed to air - outdoor	Increased electrical resistance of connection due to oxidation or loss of pre-load	A plant-specific AMP is to be evaluated	Yes (SRP-SLR Section 3.6.2.2.3)	Not applicable. Based on ONS design and confirmed by operating experience, oxidation and loss of preload are not applicable aging mechanisms for ONS transmission connectors. See further evaluation in Section 3.6.2.2.3. The associated NUREG-2191 aging items are not used.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-006	Switchyard bus and connections composed of aluminum; copper; bronze; stainless steel; galvanized steel exposed to air - outdoor	Loss of material due to wind-induced abrasion; Increased electrical resistance of connection due to oxidation or loss of preload	A plant-specific AMP is to be evaluated	Yes (SRP-SLR Section 3.6.2.2.3)	Not applicable. Based on ONS design and confirmed by operating experience, wind-induced abrasion and oxidation or loss of pre-load are not applicable aging mechanisms for ONS switchyard bus. See further evaluation in Section 3.6.2.2.3. The associated NUREG-2191 aging items are not used.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-007	Transmission conductors composed of aluminum; steel exposed to air - outdoor	Loss of material due to wind-induced abrasion	A plant-specific AMP is to be evaluated for All Aluminum Conductor (AAC), ACAR and ACSR	Yes (SRP-SLR Section 3.6.2.2.3)	Not applicable. A causal evaluation performed as a result of site operating experience determined that this aging effect is limited to the ACSR overhead transmission conductors and drop lines to startup transformers CT1, CT2, and CT3. To address this concern, the transmission conductors and drop lines to all three startup transformers are replaced on a 10 year frequency. See Section further evaluation in Section 3.6.2.2.3. The associated NUREG-2191 aging items are not used.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-008	Electrical insulation for electrical cables and connections (including terminal blocks, etc.) composed of various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to an adverse localized environment caused by heat, radiation, or moisture	Reduced electrical insulation resistance due to thermal/ thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	AMP XI.E1, “Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”	No	Consistent with NUREG-2191.
3.6.1-009	Electrical insulation for electrical cables and connections used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance (IR) composed of various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to an adverse localized environment caused by heat, radiation, or moisture	Reduced electrical insulation resistance due to thermal/ thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	AMP XI.E2, “Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits”	No	Consistent with NUREG-2191.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-010	Electrical conductor insulation for inaccessible power, instrumentation, and control cables (e.g., installed in duct bank, buried conduit or direct buried) composed of various organic polymers such as EPR, SR, EPDM, XLPE, butyl rubber, and combined thermoplastic jacket/ insulation shield exposed to an adverse localized environment caused by significant moisture	Reduced electrical insulation resistance or degraded dielectric strength due to significant moisture	AMP XI.E3A, “Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements,” AMP XI.E3B, “Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements,” or AMP XI.E3C, “Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements”	No	Consistent with NUREG-2191. The *Electrical Insulation for Inaccessible Medium Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* (B2.1.38) program, *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* (B2.1.39) program, and *Electrical Insulation for Inaccessible Low Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* (B2.1.40) program will be used to manage reduced electrical insulation resistance or degraded dielectric strength of the various organic polymers in electrical conductor insulation for inaccessible medium voltage (>2 kV to 35 kV) power, instrumentation and control and low voltage

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
					(typically < 1 kV but no greater than 2 kV) cables exposed to adverse localized environments caused by significant moisture.
3.6.1-011	Metal enclosed bus: enclosure assemblies composed of elastomers exposed to air – indoor controlled or uncontrolled, air – outdoor	Surface cracking, crazing, scuffing, dimensional change (e.g. “ballooning” and “necking”), shrinkage, discoloration, hardening or loss of strength due to elastomer degradation	AMP XI.E4, “Metal Enclosed Bus,” or AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Consistent with NUREG-2191. The *Metal Enclosed Bus* (B2.1.41) program will manage surface cracking, crazing, scuffing, dimensional change (e.g. “ballooning” and “necking”), shrinkage, discoloration, hardening or loss of strength of metal enclosed bus enclosure assemblies composed of elastomers exposed to an air-indoor controlled, air-indoor uncontrolled, or air-outdoor environment.
3.6.1-012	Metal enclosed bus: bus/ connections composed of various metals used for electrical bus and connections exposed to air – indoor controlled or uncontrolled, air –outdoor	Increased electrical resistance of connection due to the loosening of bolts caused by thermal cycling and ohmic heating	AMP XI.E4, “Metal Enclosed Bus”	No	Consistent with NUREG-2191.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-013	Metal enclosed bus: electrical insulation; insulators composed of porcelain; xenoy; thermo-plastic organic polymers exposed to air – indoor controlled or uncontrolled, air – outdoor	Reduced electrical insulation resistance due to thermal/ thermoxidative degradation of organics/ thermoplastics, radiation-induced oxidation, moisture/debris intrusion, and ohmic heating	AMP XI.E4, “Metal Enclosed Bus”	No	Consistent with NUREG-2191.
3.6.1-014	Metal enclosed bus: external surface of enclosure assemblies composed of steel exposed to air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.E4, “Metal Enclosed Bus,” or AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191. The *Metal Enclosed Bus* (B2.1.41) program will manage loss of material due to general, pitting, or crevice corrosion of metal enclosed bus enclosure assemblies composed of steel exposed to an air-indoor uncontrolled environment.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-015	Metal enclosed bus: external surface of enclosure assemblies composed of galvanized steel; aluminum exposed to air - outdoor	Loss of material due to pitting, crevice corrosion	AMP XI.E4, “Metal Enclosed Bus,” or AMP XI.S6, “Structures Monitoring”	No	Consistent with NUREG-2191. The *Metal Enclosed Bus* (B2.1.41) program will manage loss of material due to general, pitting, or crevice corrosion of metal enclosed bus enclosure assemblies composed of aluminum exposed to an air-outdoor environment.
3.6.1-016	Fuse holders (not part of active equipment): metallic clamps composed of various metals used for electrical connections exposed to air – indoor uncontrolled	Increased electrical resistance of connection due to chemical contamination, corrosion, and oxidation (in an air, indoor controlled environment, increased resistance of connection due to chemical contamination, corrosion and oxidation do not apply)	AMP XI.E5, “Fuse Holders” - No AMP is required for those applicants who can demonstrate these fuse holders are located in an environment that does not subject them to environmental aging mechanisms and effects due to chemical contamination, corrosion, and oxidation.	No	Consistent with NUREG-2191.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-017	Fuse holders (not part of active equipment): metallic clamps composed of various metals used for electrical connections exposed to air-indoor controlled or uncontrolled	Increased electrical resistance of connection due to fatigue from ohmic heating, thermal cycling, electrical transients.	AMP XI.E5, “Fuse Holders” - No AMP is required for those applicants who can demonstrate these fuse holders are not subject to fatigue due to ohmic heating, thermal cycling, electrical transients.	No	Consistent with NUREG-2191.
3.6.1-018	Fuse holders (not part of active equipment): metallic clamps composed of various metals used for electrical connections exposed to air-indoor controlled or uncontrolled	Increased electrical resistance of connection due to fatigue caused by frequent fuse removal/ manipulation or vibration	AMP XI.E5, “Fuse Holders” - No AMP is required for those applicants who can demonstrate these fuse holders are not subject to fatigue caused by frequent fuse removal/manipulation or vibration.	No	Consistent with NUREG-2191.
3.6.1-019	Cable connections (metallic parts) composed of various metals used for electrical contacts exposed to air – indoor controlled or uncontrolled, air – outdoor	Increased electrical resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	AMP XI.E6, “Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”	No	Consistent with NUREG-2191.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-020	Electrical connector contacts for electrical connectors composed of various metals used for electrical contacts exposed to air with borated water leakage	Increased electrical resistance of connection due to corrosion of connector contact surfaces caused by intrusion of borated water	AMP XI.M10, “Boric Acid Corrosion”	No	Consistent with NUREG-2191.
3.6.1-021	Transmission conductors composed of aluminum exposed to air – outdoor	Loss of conductor strength due to corrosion	None - for ACAR and All Aluminum Conductor (AAC)	No	Consistent with NUREG-2191.
3.6.1-022	Fuse holders (not part of active equipment): insulation material composed of electrical insulation material: bakelite; phenolic melamine or ceramic; molded polycarbonate, and other, exposed to air – indoor controlled or uncontrolled	Reduced electrical insulation resistance due to thermal/ thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	AMP XI.E5, “Fuse Holders” - No AMP is required for those applicants who can demonstrate these fuse holders are located in an environment that does not subject them to environmental aging mechanisms	No	Consistent with NUREG-2191.
3.6.1-023	Metal enclosed bus: external surface of enclosure assemblies. Galvanized steel; aluminum. air - indoor controlled or uncontrolled	None	None	No	Consistent with NUREG-2191.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-024	Metal enclosed bus: external surface of enclosure assemblies. Steel air – indoor controlled	None	None	No	Consistent with NUREG-2191.
3.6.1-027	Cable bus: external surface of enclosure assemblies galvanized steel; aluminum; air – indoor controlled or uncontrolled	None	None	No	Not applicable. ONS has no galvanized steel or aluminum cable bus, external surfaces of enclosure assemblies, exposed to air - indoor, controlled or uncontrolled environments in Electrical Commodities. See further evaluation in Section 3.6.2.2.2. The associated NUREG-2191 aging items are not used.
3.6.1-029	Cable bus: electrical insulation; insulators – exposed to air – indoor controlled or uncontrolled, air – outdoor	Reduced electrical insulation resistance due to degradation caused thermal/ thermoxidative degradation of organics and photolysis (UV sensitive materials only) of organics, moisture/debris intrusion and ohmic heating	A plant-specific AMP is to be evaluated	Yes (SRP-SLR Section 3.6.2.2.2)	Not applicable. ONS has no cable bus, electrical insulation and insulators, exposed to air - indoor, controlled or uncontrolled, or air - outdoor in Electrical Commodities. See further evaluation in Section 3.6.2.2.2. The associated NUREG-2191 aging items are not used.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-030	Cable bus: external surface of enclosure assemblies composed of steel exposed to air – indoor uncontrolled or air – outdoor	Loss of material due to general, pitting, crevice corrosion	A plant-specific AMP is to be evaluated	Yes (SRP-SLR Section 3.6.2.2.2)	Not applicable. ONS has no cable bus, external surface of enclosure assemblies, composed of steel, exposed to air - indoor, controlled or uncontrolled, or air - outdoor in Electrical Commodities. See further evaluation in Section 3.6.2.2.2. The associated NUREG-2191 aging items are not used.
3.6.1-031	Cable bus external surface of enclosure assemblies composed of galvanized steel; aluminum exposed to air – outdoor	Loss of material due to general, pitting, crevice corrosion	A plant-specific AMP is to be evaluated	Yes (SRP-SLR Section 3.6.2.2.2)	Not applicable. ONS has no cable bus, external surface of enclosure assemblies, composed of galvanized steel or aluminum, exposed to air - outdoor in Electrical Commodities. See further evaluation in Section 3.6.2.2.2. The associated NUREG-2191 aging items are not used.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapters VI of the GALL-SLR Report

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-032	Cable bus: external surface of enclosure assemblies: composed of steel; air – indoor controlled	None	None	No	Not applicable. ONS has no cable bus, external surface of enclosure assemblies, composed of steel, exposed to air - indoor, controlled in Electrical Commodities. See further evaluation in Section 3.6.2.2.2. The associated NUREG-2191 aging items are not used.

Results Tables: Electrical and Instrumentation and Controls Aging Management Review Results

Table 3.6.2-1 Electrical and Instrumentation and Controls - Electrical and Instrumentation and Controls Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-2191 Item	NUREG-2192 Table 1 Item	Notes
Cable Connections (Metallic Parts)	Electrical Continuity	Various Metals Used for Electrical Contacts	Air - Indoor, Controlled or Uncontrolled, or Air - Outdoor	Increased Electrical Resistance of Connection	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.43)	VI.A.LP-30	3.6.1-019	A
Electric Equipment Subject to 10 CFR 50.49 EQ Requirements	Electrical Continuity	Various Metallic Material	10 CFR 50.49 EQ Environments	Various Aging Effects	Environmental Qualification of Electric Equipment (B3.3)	VI.B.L.05	3.6.1-001	A
			Adverse Localized Environment	Various Aging Effects	Environmental Qualification of Electric Equipment (B3.3)	VI.B.L.05	3.6.1-001	A
	Electrical Insulation	Various Polymeric Materials	10 CFR 50.49 EQ Environments	Various Aging Effects	Environmental Qualification of Electric Equipment (B3.3)	VI.B.L.05	3.6.1-001	A
			Adverse Localized Environment	Various Aging Effects	Environmental Qualification of Electric Equipment (B3.3)	VI.B.L.05	3.6.1-001	A

Table 3.6.2-1 Electrical and Instrumentation and Controls - Electrical and Instrumentation and Controls Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-2191 Item	NUREG-2192 Table 1 Item	Notes
Connector Contacts for Electrical Connections Exposed to Borated Water	Electrical Continuity	Various Metals Used for Electrical Contacts	Air with Borated Water Leakage	Increased Electrical Resistance of Connection Due to Corrosion of Connector Contact Surfaces Caused By Intrusion of Borated Water	Boric Acid Corrosion (B2.1.4)	VI.A.LP-36	3.6.1-020	A
Electrical Insulation for Electrical Cables and Connections	Electrical Insulation	Various Organic Polymers	Adverse Localized Environment	Reduced Electrical Insulation Resistance	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.36)	VI.A.LP-33	3.6.1-008	A
Electrical Insulation for Electrical Cables and Connections used in Instrumentation Circuits	Electrical Insulation	Various Organic Polymers	Adverse Localized Environment	Reduced Electrical Insulation Resistance	Electrical Insulation for Electrical Cable and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B2.1.37)	VI.A.LP-34	3.6.1-009	A

Table 3.6.2-1 Electrical and Instrumentation and Controls - Electrical and Instrumentation and Controls Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-2191 Item	NUREG-2192 Table 1 Item	Notes
Electrical Conductor Insulation of Inaccessible Instrumentation and Control Cables	Electrical Insulation	Various Organic Polymers	Adverse Localized Environment Caused by Significant Moisture	Reduced Electrical Insulation Resistance or Degraded Dielectric Strength	Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements (B2.1.39)	VI.A.LP-35b	3.6.1-010	A
Electrical Conductor Insulation for Inaccessible Low-Voltage Power Cable - Typical Operating Voltage of <1 kV but no Greater than 2 kV	Electrical Insulation	Various Organic Polymers	Adverse Localized Environment Caused by Significant Moisture	Reduced Electrical Insulation Resistance or Degraded Dielectric Strength	Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements (B2.1.40)	VI.A.LP-35c	3.6.1-010	A
Electrical Conductor Insulation for Inaccessible Medium-Voltage Power Cables - Typical Operating Range of 2 kV to 35 kV	Electrical Insulation	Various Organic Polymers	Adverse Localized Environment Caused by Significant Moisture	Reduced Electrical Insulation Resistance or Degraded Dielectric Strength	Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements (B2.1.38)	VI.A.LP-35a	3.6.1-010	A

Table 3.6.2-1 Electrical and Instrumentation and Controls - Electrical and Instrumentation and Controls Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-2191 Item	NUREG-2192 Table 1 Item	Notes
Fuse Holders (Not Part of Active Equipment): Electrical Insulation	Electrical Insulation	Electrical Insulation: Bakelite; Phenolic Melamine or Ceramic; Molded Polycarbonate; Other Organic Polymers	Air - Indoor, Controlled or Uncontrolled	Reduced Electrical Insulation Resistance	Fuse Holders (B2.1.42)	VI.A.LP-24	3.6.1-022	A
Fuse Holders (Not Part of Active Equipment): Metallic Clamps	Electrical Continuity	Various Metals used for Electrical Connections	Air - Indoor Uncontrolled	Increased Electrical Resistance of Connection	Fuse Holders (B2.1.42)	VI.A.LP-23	3.6.1-016	A
			Air - Indoor Controlled or Uncontrolled			VI.A.LP-31	3.6.1-018	A
						VI.A.L-07	3.6.1-017	A
High Voltage Electrical Insulators	Electrical Insulation	Porcelain; Malleable Iron; Aluminum; Galvanized Steel; Cement	Air - Outdoor	Loss of material due to mechanical wear or corrosion caused by movement of transmission conductors due to significant wind	None	VI.A.LP-32	3.6.1-002	I, 1

Table 3.6.2-1 Electrical and Instrumentation and Controls - Electrical and Instrumentation and Controls Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-2191 Item	NUREG-2192 Table 1 Item	Notes
High Voltage Electrical Insulators	Electrical Insulation	Porcelain; Malleable Iron; Aluminum; Galvanized Steel; Cement	Air - Outdoor	Reduced electrical insulation resistance due to presence of cracks, foreign debris, salt, dust, cooling tower plume or industrial effluent contamination	None	VI.A.LP-28	3.6.1-003	I, 2
Metal Enclosed Bus: Enclosure Assemblies	Shelter, Protection	Various Elastomers	Air - Indoor, Controlled or Uncontrolled, or Air - Outdoor	Surface cracking, crazing, scuffing, dimensional change (e.g. "ballooning" and "necking"), shrinkage, discoloration, hardening or loss of strength due to elastomer degradation	Metal Enclosed Bus (B2.1.41)	VI.A.LP-29	3.6.1-011	A
Metal Enclosed Bus: Bus/ Connections	Electrical Continuity	Various Metals Used for Electrical Bus Connections	Air - Indoor, Controlled or Uncontrolled, or Air - Outdoor	Increased Electrical Resistance of Connection	Metal Enclosed Bus (B2.1.41)	VI.A.LP-25	3.6.1-012	A

Table 3.6.2-1 Electrical and Instrumentation and Controls - Electrical and Instrumentation and Controls Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-2191 Item	NUREG-2192 Table 1 Item	Notes
Metal Enclosed Bus: Insulation, Electrical Insulators	Electrical Insulation	Porcelain, Various Organic Polymers	Air - Indoor, Controlled or Uncontrolled, or Air - Outdoor	Reduced Electrical Insulation Resistance	Metal Enclosed Bus (B2.1.41)	VI.A.LP-26	3.6.1-013	A
Metal Enclosed Bus: External Surface of Enclosure Assemblies	Shelter Protection	Galvanized Steel; Aluminum	Air - Outdoor	Loss of Material	Metal Enclosed Bus (B2.1.41)	VI.A.LP-42	3.6.1-015	A
Metal Enclosed Bus: External Surface of Enclosure Assemblies	Shelter Protection	Galvanized Steel; Aluminum	Air - Indoor, Controlled or Uncontrolled	None	None	VI.A.LP-41	3.6.1-023	A
Metal Enclosed Bus: External Surface of Enclosure Assemblies	Shelter Protection	Steel	Air - Indoor, Uncontrolled and Air - Outdoor	Loss of Material	Metal Enclosed Bus (B2.1.41) or Structures Monitoring (B2.1.33)	VI.A.LP-43	3.6.1-014	A
Switchyard Bus and Connections	Electrical Continuity	Aluminum, Stainless Steel, Copper, Bronze, Galvanized Steel	Air - Outdoor	None	None	VI.A.LP-39	3.6.1-006	I, 3

Table 3.6.2-1 Electrical and Instrumentation and Controls - Electrical and Instrumentation and Controls Commodities - Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-2191 Item	NUREG-2192 Table 1 Item	Notes
Transmission Conductors	Electrical Continuity	Aluminum	Air - Outdoor	None	None	VI.A.LP-46	3.6.1-021	A
		Aluminum, Steel	Air - Outdoor	None	None	VI.A.LP-38	3.6.1-004	I, 5
				None	None	VI.A.LP-47	3.6.1-007	I, 4
Transmission Conductors	Electrical Continuity	Aluminum, Steel	Air - Outdoor	None	None	VI.A.LP-48	3.6.1-005	I, 6

Table 3.6.2-1 Plant-Specific Notes:

1. Based on ONS design and OE, loss of material is not an applicable aging effect for ONS high voltage electrical insulators. In scope high voltage electrical insulator comprised of porcelain, malleable iron, aluminum, galvanized steel, and cement in an air - outdoor environment are not subject to mechanical wear or corrosion caused by wind blowing on transmission conductors. For more information, see Section 3.6.2.3.1.

2. Based on ONS design and OE, reduced insulation resistance is not an applicable aging effect for ONS high voltage electrical insulators. In scope high voltage electrical insulators comprised of porcelain, malleable iron, aluminum, galvanized steel, and cement in an air - outdoor environment are not subject to reduced electrical insulation resistance due to presence of cracks, foreign debris, salt, dust, cooling tower plume, or industrial effluent contamination. For more information, see Section 3.6.2.3.1.

3. Based on ONS design and OE, loss of material and increased resistance of connection are not applicable aging effects for ONS switchyard bus and connections. In scope switchyard bus and connections comprised of aluminum and stainless steel in an air - outdoor environment are not subject to wind induced abrasion nor oxidation of loss of preload. For more information, see Section 3.6.2.2.3.

4. Based on ONS design and operating experience, loss of material is not an applicable aging effect for ONS aluminum conductor steel reinforced transmission conductors. In scope ONS transmission conductors comprised of aluminum and steel in an air – outdoor environment are not subject to wind induced abrasion. For more information see Section 3.6.2.2.3.

5. Based on ONS design and operating experience, loss of conductor strength is not an applicable aging effect for ONS ACSR transmission conductors. In scope ONS transmission conductors comprised of aluminum and steel in an air – outdoor environment are not subject to corrosion. For more information see Section 3.6.2.2.3.

6. Based on ONS design and operating experience, increased resistance of connection is not an applicable aging effect for ONS transmission connectors. In scope ONS transmission connectors utilize good bolting practices, are treated with inhibitors to avoid connection oxidation and torqued at the time of installation to avoid the loss of preload. Transmission connectors are designed in installed utilizing stainless steel lock washers that provide vibration absorption and prevent loss of preload. Therefore, based on ONS design and confirmed by operating experience, oxidation and loss of preload are not applicable aging mechanisms for ONS transmission connectors. For more information see Section 3.6.2.2.3.

Table 3.6.2-1 Industry Standard Notes:

A. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

B. Consistent with NUREG-2191 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-2191 AMP.

C. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP is consistent with NUREG-2191 AMP.

D. Component is different, but consistent with NUREG-2191 item for material, environment, and aging effect. AMP takes some exceptions to the NUREG-2191 AMP.

E. Consistent with NUREG-2191 item for material, environment, and aging effect, but a different AMP is credited or NUREG-2191 identifies a plant-specific AMP.

F. Material not in NUREG-2191 for this component.

G. Environment not in NUREG-2191 for this component and material.

H. Aging effect not in NUREG-2191 for this component, material and environment combination.

I. Aging effect in NUREG-2191 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-2191.

4.0 TIME-LIMITED AGING ANALYSES

Time limited aging analyses (TLAA) are described in 10 CFR 54, *"Requirements for Renewal of Operating Licenses for Nuclear Power Plants."* Section 4.0 presents the description of the TLAA for Oconee 1, 2 and 3 in accordance with 10 CFR 54.3(a) and 10 CFR 54.21(c). Section 4.0 is divided into Sections 4.1 through 4.7.

Section 4.1 provides the regulatory definitions and standards required to demonstrate TLAA acceptability through the subsequent period of extended operation. The process used for identifying and evaluating TLAA and exemptions are also summarized there along with a summary of the overall results.

The specific results of evaluations of TLAA and any exemptions that are based on TLAA in accordance with 10 CFR 54.21(c) are provided in subsequent sections, as follows:

- Reactor Vessel Neutron Embrittlement Analysis (Section 4.2)
- Metal Fatigue (Section 4.3)
- Environmental Qualification of Electric Equipment (Section 4.4)
- Concrete Containment Tendon Prestress (Section 4.5)
- Containment Liner Plate, Metal Containments, and Penetrations Fatigue (Section 4.6)
- Other Plant-Specific Time-Limited Aging Analyses (Section 4.7)

4.1 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES

TLAA are defined in 10 CFR 54.3(a) as those licensee calculations and analyses that meets all six of the following specific criteria:

1. Involves systems, structures, and components within the scope of license renewal, as delineated in 10 CFR 54.4(a);

2. Considers the effects of aging;

3. Involves time-limited assumptions defined by the current operating term, for example, 40 years,

4. Was determined to be relevant by the licensee in making a safety determination;

5. Involves conclusions or provides the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in 54.4(b); and

6. Is contained or incorporated by reference in the CLB.

4.1.1 TIME-LIMITED AGING ANALYSES IDENTIFICATION PROCESS

The process used to identify the ONS-specific time limited aging analyses is consistent with the guidance provided in NEI 17-01, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal," NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report" and NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants."

The identification of the ONS TLAA began with the development of a list of potential TLAA identified from documentation that describes the ONS CLB. This list of potential TLAA was also compared to other industry documents that list TLAA to ensure completeness of the identification of the potential ONS TLAA.

Keyword searches of the documentation that describes the ONS CLB included the following documents:

- UFSAR
- Facility Operating Licenses
- Quality Assurance Program
- Inservice Inspection and Inservice Testing Program Documents
- Offsite Dose Calculation Manual
- Technical Specifications and Bases
- Docketed Licensing Correspondence
- Design Specifications, Calculations and Reports incorporated by reference in CLB
- Exemptions granted pursuant to 10 CFR 50.12

Industry documents to which the potential ONS TLAA were compared included:

- NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report" [Reference 1.7.3]
- NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" [Reference 1.7.2]
- NEI 17-01, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal" [Reference 1.7.6]
- Sampling of recent License Renewal Applications or associated SER for B&W PWR designs and PWR plants which utilize B&W fabricated reactor vessels
- Sampling of recent License Renewal Applications or associated SER for other PWR designs

Finally, the Oconee SER [Reference 4.1-9] for initial license renewal was also reviewed to ensure all TLAAs from the initial license renewal period were either included or otherwise justified as no longer applicable for SLR.

The list of potential Oconee TLAA was then reviewed against the TLAA definition in 10 CFR 54.3(a). Potential TLAAs that met all six elements of the 10 CFR 54.3(a) definition were identified as ONS TLAA that required evaluation for the SPEO. For each TLAA from the initial license renewal there is a corresponding TLAA for the SPEO.

4.1.2 EVALUATION OF TIME-LIMITED AGING ANALYSIS

For each TLAA identified, 10 CFR 54.21(c)(1) requires that the applicant shall demonstrate that

(i) The analyses remain valid for the PEO;
(ii) The analyses have been projected to the end of the PEO; or
(iii) The effects of aging on the intended function(s) will be adequately managed for the PEO.

In subsequent sections, the following details are captured for each Oconee TLAA and serve as the demonstration prescribed in 10 CFR 54.21(c)(1).

<u>TLAA Description:</u>

A description of the analysis that has been identified as a TLAA, including a description of the associated aging effect and the time-limited assumption used in the analysis.

<u>TLAA Evaluation:</u>

The evaluation of the TLAA for the SPEO. This section provides the information associated with 80 years of operation for comparison with the information used in the related TLAA that considered the previous license term of operation. This evaluation provides the basis for the disposition, which will be one of the three options specified in 10 CFR 54.21(c)(1).

<u>TLAA Disposition:</u>

Each TLAA is demonstrated acceptable in accordance with one of the three options from 10 CFR 54.21(c)(1).

4.1.3 IDENTIFICATION AND EVALUATION OF EXEMPTIONS

10 CFR 54.21(c)(2) requires a list of plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on time-limited aging analyses as defined in 10 CFR 54.3. For exemptions that have such a time dependency, the applicant shall provide an evaluation that justifies the continuation of these exemptions for the period of extended operation.

A review of the Oconee CLB was performed, and the results of this review confirmed that no exemptions to 10 CFR 50.12 have been granted based on a TLAA as defined in 10 CFR 54.3.

4.1.4 SUMMARY OF RESULTS

Sections 4.2 through Section 4.7 of this chapter describe the evaluations of six general categories of TLAA. The TLAA categories and associated analysis are listed in Table 4.1.4-1, *Time-Limited Aging Analyses Categories and Dispositions*. The TLAA categories are presented in the order in which they appear in Sections 4.2 through Section 4.7 of NUREG-2192**.** The table entries also indicate the disposition method used in evaluating the TLAA and include a reference to the applicable SLRA section where the TLAA is evaluated for the SPEO.

As an aid to the reviewer, two additional summary tables, Table 4.1.4-2 and Table 4.1.4-3, have been provided. Both Table 4.1.4-2, *Review of TLAA Listed in NUREG-2192, Table 4.1-2* and Table 4.1.4-3, *Review of TLAA Listed in NUREG-2192, Table 4.7-1* list the example TLAA provided in NUREG-2192 and specify whether they have been identified as TLAA for ONS. The sections where the applicable TLAA are evaluated are identified. Those items with a “Yes” entry apply. Those items with a “No” entry do not apply. These latter TLAA were found not to apply either because they are associated with design features not employed or because no analysis was identified that meets all six elements of the TLAA definition in 10 CFR 54.3(a).

Table 4.1.4-1: Oconee Time-Limited Aging Analyses Categories and Dispositions

TLAA CATEGORY	ANALYSIS	DISPOSITION (Note 1)	SECTION
REACTOR VESSEL NEUTRON EMBRITTLEMENT	Neutron Fluence Projections	(ii)	4.2.1
	Upper-Shelf Energy	(ii)	4.2.2
	Pressurized Thermal Shock	(ii)	4.2.3
	Pressure-Temperature Limits	(iii)	4.2.4
	Low Temperature Overpressure Protection	(iii)	4.2.5
METAL FATIGUE	Transient Cycle Projections for 80 Years	Not Applicable	4.3.1
	Class 1 Fatigue Analyses	(iii)	4.3.2
	Non-Class 1 Fatigue Analyses	(i)	4.3.3
	Environmentally Assisted Fatigue	(iii)	4.3.4
	Analytical Evaluation of Flaws	(iii)	4.3.5
	Weld Overlay Fatigue Analysis	(iii)	4.3.6

Table 4.1.4-1: Oconee Time-Limited Aging Analyses Categories and Dispositions

TLAA CATEGORY	ANALYSIS	DISPOSITION (Note 1)	SECTION
ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT	Environmental Qualification of Electrical Equipment Program	(iii)	4.4
CONCRETE CONTAINMENT TENDON PRESTRESS	Concrete Containment Tendon Prestress	(iii)	4.5
CONTAINMENT LINER PLATE, METAL CONTAINMENTS AND PENETRATIONS FATIGUE ANALYSES	Containment Liner Plate	(iii)	4.6.1
	Metal Containment	Not Applicable	4.6.2
	Containment Penetrations Fatigue Analyses	(iii)	4.6.3

Table 4.1.4-1: Oconee Time-Limited Aging Analyses Categories and Dispositions

TLAA CATEGORY	ANALYSIS	DISPOSITION (Note 1)	SECTION
OTHER PLANT SPECIFIC TLAAs	Reactor Vessel Internals - Loss of Fracture Toughness due to Neutron Embrittlement	(iii)	4.7.1.1
	Reactor Vessel Internals - Flow Induced Vibration Endurance Limits	(ii)	4.7.1.2
	Reactor Vessel Internals - Irradiation Embrittlement	(ii)	4.7.1.3
	Reactor Pressure Vessel Underclad Cracking	(ii)	4.7.2
	Reactor Coolant Pump Flywheel Fatigue Crack Growth Analyses	(ii)	4.7.3
	Leak-Before-Break Analysis for Reactor Coolant System Piping	(i)	4.7.4
	Crane Load Cycle Limits	(i)	4.7.5

Note 1:
(i) Validation: The analyses remain valid for the SPEO.
(ii) Projection: The analyses have been projected to the end of the SPEO.
(iii) Aging Management: The effects of aging on the intended function(s) will be adequately managed for the SPEO.

Table 4.1.4-2: Review of Time-Limited Aging Analyses Listed in NUREG-2192, Table 4.1-2

NUREG-2192, Table 4.1-2 - Generic Time-Limited Aging Analyses	Applies to ONS	SLRA Section
REACTOR VESSEL NEUTRON EMBRITTLEMENT		
Neutron Fluence	Yes	4.2.1
Pressurized Thermal Shock (PWRs Only)	Yes	4.2.3
Upper-Shelf Energy (PWRs and BWRs)	Yes	4.2.2
Pressure-Temperature Limits (PWRs and BWRs)	Yes	4.2.4
Low Temperature Overpressure Protection System Setpoints (PWRs Only)	Yes	4.2.5
Ductility Reduction Evaluation for Reactor Internals (B&W designed PWRs only)	Yes	4.7.1.1
Reactor Vessel Circumferential Weld Relief - Probability of Failure and Mean Adjusted Reference Temperature Analysis for the RV Circumferential Welds (BWRs only)	No	NA
Reactor Vessel Axial Weld Probability of Failure and Mean Adjusted Reference Temperature Analysis (BWRs only)	No	NA
METAL FATIGUE		
Metal Fatigue of Class 1 Components	Yes	4.3.2
Metal Fatigue of Non-Class 1 Components	Yes	4.3.3
Environmentally Assisted Fatigue	Yes	4.3.4
High Energy Line Break Analyses	No (Note 1)	NA

Table 4.1.4-2: Review of Time-Limited Aging Analyses Listed in NUREG-2192, Table 4.1-2

NUREG-2192, Table 4.1-2 - Generic Time-Limited Aging Analyses	Applies to ONS	SLRA Section
Cycle-Dependent Fracture Mechanics or Flaw Evaluations	Yes	4.3.5
Cycle-Dependent Fatigue Waivers	Yes	4.3.2.9
Environmental Qualification of Electric Equipment	Yes	4.4
Concrete Containment Tendon Prestress	Yes	4.5
Containment Liner Plate, Metal Containments, and Penetrations Fatigue	Yes	4.6

Note 1: A review of the ONS CLB was performed, which included HELB postulation for low pressure injection/ decay heat removal piping. For Units 1, 2, and 3, thermal aging was addressed through the lower-bound, unaged J-R curve for submerged arc welds and gas-tungsten arc welds from NUREG/CR-6428. It was also found that an explicit fatigue analysis was not necessary since the stresses at the critical locations are too low to justify a need for a quantitative fatigue crack growth analysis. Therefore, the leak before break analyses for the Units 1, 2, and 3 low pressure injection/decay heat removal piping are not TLAA.

Table 4.1.4-3: Review of Generic Time-Limited Aging Analyses Listed in NUREG-2192, Table 4.7-1

NUREG-2192, Table 4.7-1 - Examples of Potential Plant Specific TLAA Topics	Applies to ONS	SLRA Section
Reactor Pressure Vessel Underclad Cracking	Yes	4.7.2
Leak Before Break	Yes	4.7.4
Reactor Coolant Pump Flywheel Fatigue Crack Growth	Yes	4.7.3
Response to NRC Bulletin 88-11, Pressurizer Surge Line Thermal Stratification	Yes	4.3.2.8
Response to NRC Bulletin 88-08, Thermal Stresses in Piping Connected to Reactor Cooling Systems	No (Note 1)	NA
Fatigue of Cranes (Crane Cycle Limits)	Yes	4.7.5
Fatigue of the Spent Fuel Pool Liner	No (Note 2)	NA
Corrosion Allowance Calculations	No (Note 2)	NA
Flaw Growth Due to Stress Corrosion Cracking	No (Note 2)	NA
Predicted Lower Limit	No (Note 2)	NA

Note 1: No ASME Code, Section III cumulative usage factor analyses were generated in response to NRC Bulletin 88-08. Ultrasonic inspections were performed in response to NRC Bulletin 88-08.

Note 2: Not a TLAA for Oconee

4.1.5 REFERENCES

4.1-1 NUREG-1839 (Part 1), Safety Evaluation Report Related to the License Renewal of the Point Beach Nuclear Plant, Units 1 and 2, December 2005, ADAMS Accession Number ML053420134

4.1-2 NUREG-1839 (Part 2), Safety Evaluation Report Related to the License Renewal of the Point Beach Nuclear Plant, Units 1 and 2, December 2005, ADAMS Accession Number ML053420137

4.1-3 NUREG-2193, Volume 1, Safety Evaluation Report Related to the License Renewal of Davis-Besse Nuclear Power Station, April 2016, ADAMS Accession Number ML16104A207

4.1-4 NUREG-2193, Volume 2, Safety Evaluation Report Related to the License Renewal of Davis-Besse Nuclear Power Station, April 2016, ADAMS Accession Number ML16104A301

4.1-5 Safety Evaluation Report Related to the Subsequent License Renewal of Turkey Point Generating Units 3 and 4, December 2019, ADAMS Accession Number ML19191A057

4.1-6 Safety Evaluation Report Related to the Subsequent License Renewal of Surry Power Station, Units 1 and 2, March 2020, ADAMS Accession Number ML20052F523

4.1-7 NUREG-1916, Volume 1 (Parts 1 & 2), Safety Evaluation Report Related to the License Renewal of Shearon Harris Nuclear Power Plant, November 2008, Unit 1, ADAMS Accession Numbers ML090050172 and ML090060137

4.1-8 NUREG-1916, Volume 2, Safety Evaluation Report Related to the License Renewal of Shearon Harris Nuclear Power Plant, November 2008, Unit 1, ADAMS Accession Number ML090020420

4.1-9 NUREG-1723, Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3, March 2000, ADAMS Accession Number ML003695154

4.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT ANALYSES

10 CFR 50.60, *“Acceptance Criteria for Fracture Prevention Measures for Lightwater Nuclear Reactors for Normal Operation,”* requires that all light water reactors meet the fracture toughness, Pressure-Temperature limits, and materials surveillance program requirements for the reactor coolant pressure boundary as set forth in 10 CFR 50, Appendices G and H. 10 CFR 50.61 requires that all light water reactors meet the fracture toughness requirements for protection against pressurized thermal shock events. The ONS *Reactor Vessel Material Surveillance* AMP (B2.1.19, GALL-SLR XI.M31), which is an integrated surveillance program as defined by 10 CFR 50 Appendix H, in combination with the ONS *Neutron Fluence Monitoring* AMP (B3.2, GALL-SLR X.M2) will ensure that the TLAA requirements of 10 CFR 50 Appendix G and 10 CFR 50.61 reported herein remain valid through the SPEO.

The ferritic materials of the reactor vessel are subject to embrittlement due to high energy (E > 1.0 MeV) neutron exposure. Embrittlement means the material has lower toughness (i.e., will absorb less strain energy during crack propagation or rupture), thus allowing a crack to propagate more easily under thermal and pressure loading. Neutron embrittlement analyses account for the reduction in fracture toughness associated with the cumulative neutron fluence. Because these neutron embrittlement analyses are evaluated for the plant's service lifetime (10 CFR 50 Appendix G, IV., Fracture Toughness Requirements, Item 1) or end-of-life (10 CFR 50.61(a)(6)), they are identified as TLAA.

<u>Current Licensing Basis</u>

Compliance with the requirements of 10 CFR 50 Appendix G and 10 CFR 50.61 by Duke Energy for 60 years of operation is in accordance with the following.

1. Letter from Duke Energy Corporation forwarding application for renewal of operating licenses for the Oconee Nuclear Station, Units 1, 2, and 3, U. S. Nuclear Regulatory Commission, July 6, 1998 [Reference 4.2-1].

2. The ONS LRA references BAW-2251A [Reference 4.2-2] relative to evaluation of reactor vessel TLAA for 60 years. All TLAA evaluations were reported at 48 EFPY.

3. NUREG-1723, Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3 [Reference 4.2-3].

4. Oconee Nuclear Station, Units 1, 2, and 3, issuance of amendments regarding revised pressure-temperature limits, ADAMS Accession No. ML14041A093 [Reference 4.2-4]

    - NRC approval of Oconee pressure-temperature limits to 54 EFPY and reconciliation of upper-shelf energy from 48 EFPY to 54 EFPY.

5. Oconee Nuclear Station, Units 1, 2, and 3 license amendment request for measurement uncertainty recapture power uprate, February 19, 2020, ADAMS Accession Number ML20050D379 and SER for measurement uncertainty recapture power uprate, January

26, 2021, ADAMS Accession Number ML20335A001 [Reference 4.2-5 and 4.2-33, respectively].

- Reduces the applicability for the reactor coolant system heatup and cooldown limit curves from 54 EFPY to 44.6 EFPY for Unit 1, to 45.3 EFPY for Unit 2, and to 43.8 EFPY for Unit 3 based on updated reactor vessel material evaluations discussed in Section IV.1 of the measurement uncertainty recapture submittal.

- Maintains RT_{PTS} and underclad cracking at 48 EFPY and upper-shelf energy at 54 EFPY for all three units.

6. All TLAA for subsequent license renewal reported in this Chapter consider the revised operating conditions (i.e, 1.64% increase in power) associated with measurement uncertainty recapture as reported in References 4.2-5 and 4.2-33. Measurement uncertainty recapture is assumed at the beginning of Cycle 30 for ONS Unit 1, Cycle 29 for ONS Unit 2, and Cycle 29 for ONS Unit 3. At present, measurement uncertainty recapture has not been implemented. Each unit is currently operating in Cycles 32, 30, and 31, respectively. The effects of the measurement uncertainty recapture were considered and found to have no impact on SLR.

<u>Subsequent License Renewal</u>

Reactor vessel beltline items must comply with the requirements of 10 CFR 50, Appendices G and H, and 10 CFR 50.61 for SLR. The reactor vessel beltline is defined by 10 CFR 50 Appendix G, II., F, and 10 CFR 50.61(a)(3) in accordance with the following definition: *"the region of the reactor vessel (shell material, including welds, heat-affected zones, and plate or forgings) that directly surrounds the effective height of the active core and the adjacent regions of the reactor vessel that are predicted to experience sufficient neutron irradiation damage to be considered in the selection of the most limiting material with regard to radiation damage during the licensed period."*

For SLR, the NRC staff has directed applicants to consider additional reactor vessel items (i.e., extended beltline) that may be subject to reduction of fracture toughness as defined in RIS 2014-11 [Reference 4.2-6]. Specifically, extended beltline means the region of the reactor vessel (shell material, including welds, heat-affected zones, and plate or forgings) adjacent to the traditional beltline region that will have associated fluence values projected to exceed 1.0E+17 n/cm^2 (E > 1.0 MeV) at end of license to experience sufficient neutron damage to be included in the beltline. In accordance with RG 1.99, Revision 2 [Reference 4.2-12], Figure 1, the fluence threshold of 1.0E+17 n/cm^2 (E > 1.0 MeV) reported in RIS-2014-11 is assumed to be at the inside wetted surface of the reactor vessel. The 72 EFPY fluence projections used to establish ONS reactor vessel beltline and extended beltline locations are discussed in Section 4.2.1.

Based on accrued EFPY through Cycles 31, 29 and 30 for Oconee Units 1 through 3 and assuming breaker-to-breaker operation and no outages per cycle (Capacity Factor = 1), the bounding projected EFPY for 80 years for each Oconee unit is less than 72 EFPY. Therefore, for Oconee, TLAA evaluations are completed to 80 years. A measurement uncertainty capture uprate is conservatively factored in at 2% for all TLAA evaluations that utilize neutron fluence as an input.

Adjusted Reference Temperatures

Adjusted reference temperatures, as defined by Regulatory Guide 1.99, Revision 2, Position 1.1, and 2.1, are utilized in the calculation of upper-shelf energy/equivalent margins (Section 4.2.2), pressurized thermal shock (Section 4.2.3), pressure-temperature limits (Section 4.2.4), low temperature overpressure (Section 4.2.5), and underclad cracking (Section 4.7.2). As such, adjusted reference temperatures are discussed in the applicable SLRA sections.

Description of Reactor Vessels: Oconee Units 1, 2, and 3

A schematic of the reactor vessel shell and closure head that applies to all 3 ONS units is provided in Figure 4.2-1. The reactor vessel shells for all three units are shown in Figure 4.2-2 for Unit 1, Figure 4.2-3 for Unit 2, and Figure 4.2-4 for Unit 3. Extended beltline items are identified with a (superscript 1) and include the reactor vessel inlet/outlet nozzles and associated welds, and the transition forging (dutchman forging) for all three units; material properties for these items have not been previously reviewed and accepted by the NRC. The remaining reactor vessel items are all considered traditional beltline items, have been reviewed previously by the NRC, and are available through the 60-year reactor vessel integrity TLAA evaluations cited above. Material properties that are required for reactor vessel integrity TLAA evaluations (beltline and extended beltline) required by 10 CFR 50 Appendix G and 10 CFR 50.61 for SLR are reported in Section 4.2.2, Upper Shelf Energy, Section 4.2.3, Pressurized Thermal Shock, and Section 4.2.4, Pressure-Temperature limits.

ONS Unit 1 Beltline and Extended Beltline Reactor Vessel Items (Figure 4.2-2)

1. Forgings are ASTM A 508 Class 2

   - Reactor vessel outlet nozzles (2) and reactor vessel inlet nozzles (4)[1]
   - Lower nozzle belt forging (AHR 54: ZV 2861)
   - Transition forging (122S347VA1)[1]

2. Plates are ASTM A 302B, Modified

   - Intermediate shell (C2197-2)
   - Upper shell (C3265-1 and C3278-1)
   - Lower shell (C2800-1 and C2800-2)

3. Linde 80 Welds

   - Reactor vessel inlet and outlet nozzle to nozzle belt forging welds[1]
   - Lower nozzle belt forging to intermediate shell circumferential weld (SA-1135)
   - Intermediate shell axial welds (SA-1073)

- Intermediate shell to upper shell circumferential weld (SA-1229, 61% ID; WF 25, 39% OD)
- Upper shell axial welds (SA-1493)
- Upper Shell-to-lower shell circumferential weld (SA-1585)
- Lower shell axial welds (SA-1430 and SA-1426)
- Lower shell forging to transition forging circumferential weld (WF-9)

ONS Unit 2 Beltline and Extended Beltline Reactor Vessel Items (Figure 4.2-3)

1. Forgings are all ASTM A 508 Class 2

- Reactor vessel outlet nozzles (2) and reactor vessel inlet nozzles (4)[1]
- Lower nozzle belt forging (AMX 77: 123T382)
- Upper shell forging (AAW 163:3P2359)
- Lower shell forging (AWG 164: 4P1885)
- Transition forging (122T293VA1)[1]

2. Linde 80 Welds

- Reactor vessel inlet and outlet nozzle to nozzle belt forging welds[1]
- Lower nozzle belt forging to upper shell forging circumferential weld (WF-154)
- Upper shell forging to lower shell forging circumferential weld (WF-25)
- Lower shell forging to transition forging circumferential weld (WF-112)

ONS Unit 3 Beltline and Extended Beltline Reactor Vessel Items (Figure 4.2-4)

1. Forgings are all ASTM A 508 Class 2

- Reactor vessel outlet nozzles (2) and reactor vessel inlet nozzles (4)[1]
- Lower nozzle belt forging (4680)
- Upper shell forging (AWS 192: 522314)
- Lower shell forging (ANK 191:522194)
- Transition forging (417543-1)[1]

2. Linde 80 Welds

- Reactor vessel inlet and outlet nozzle to nozzle belt forging welds[1]
- Lower nozzle belt forging to upper shell forging circumferential weld (WF-200)
- Upper shell forging to lower shell forging circumferential weld (WF-67, 75% ID; WF-70, 25% OD)
- Lower shell forging to transition forging circumferential weld (WF-169-1)

Note 1: Extended beltline items

The evaluations of TLAA related to neutron embrittlement for the reactor vessel items listed above are described in the following subsections.

1. Neutron Fluence Projections (Section 4.2.1)

2. Upper-Shelf Energy (Section 4.2.2)

3. Pressurized Thermal Shock (Section 4.2.3)

4. Pressure-Temperature Limits (Section 4.2.4)

5. Low Temperature Overpressure Protection (Section 4.2.5)

Figure 4.2-1: Reactor Vessel Shell and Closure Head (Longitudinal Section)

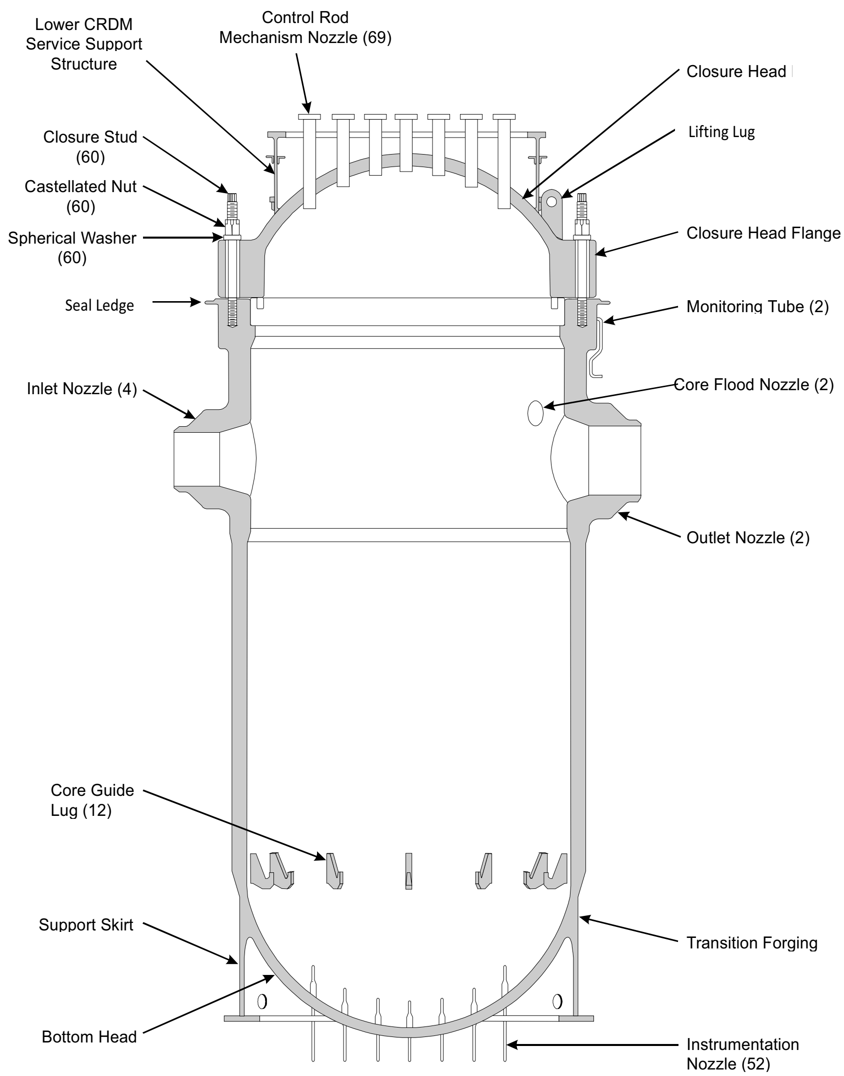


Figure 4.2-2: ONS Unit 1 Reactor Vessel Shell

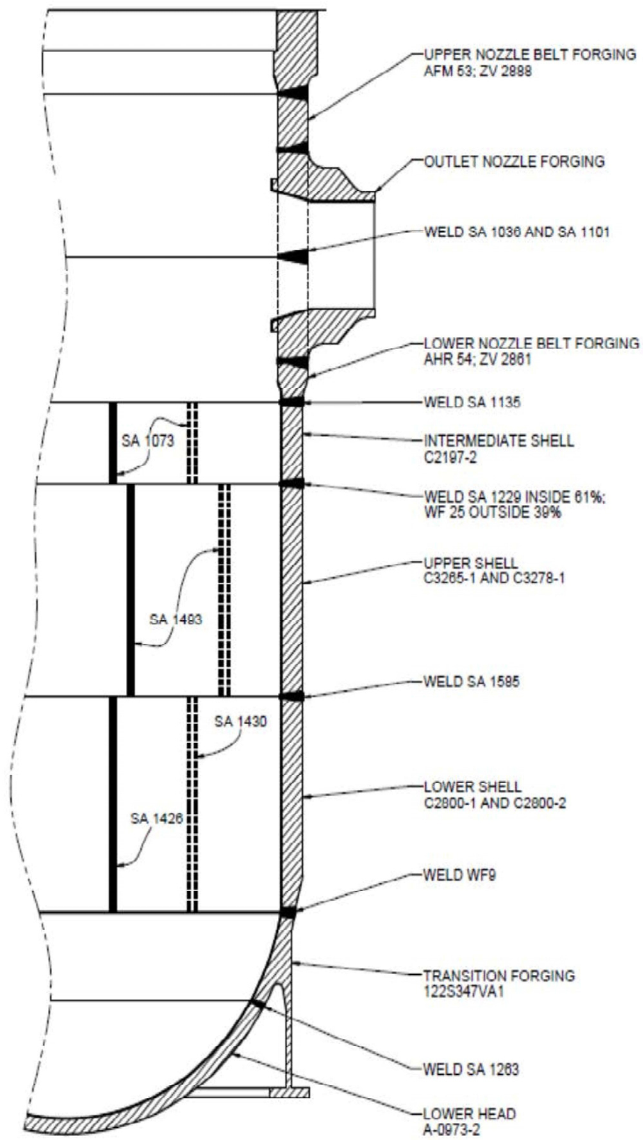


Figure 4.2-3: ONS Unit 2 Reactor Vessel Shell

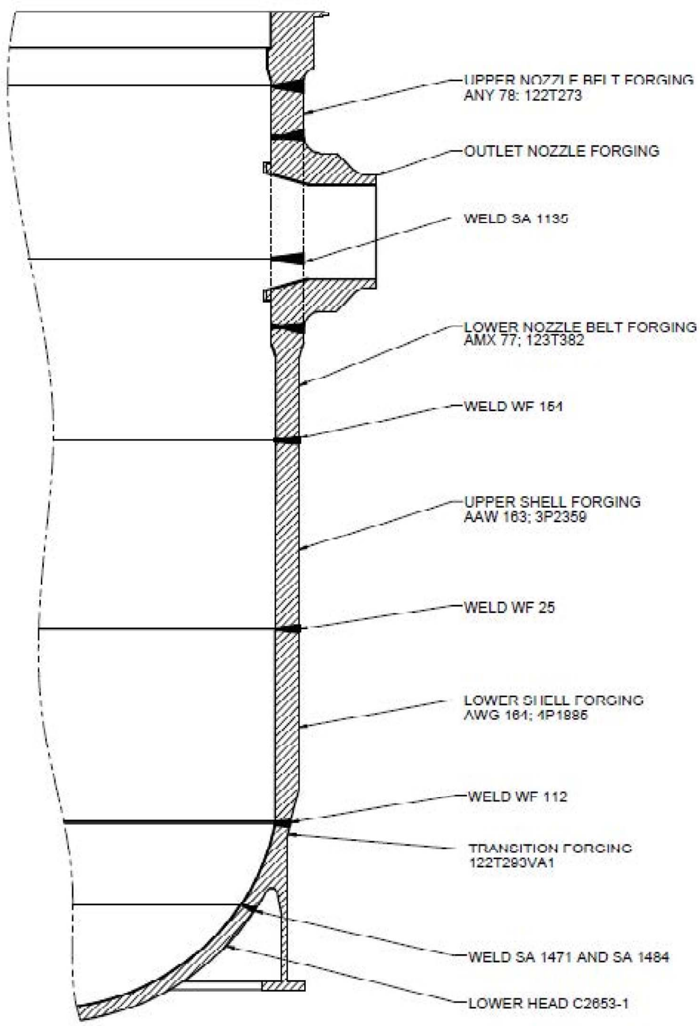
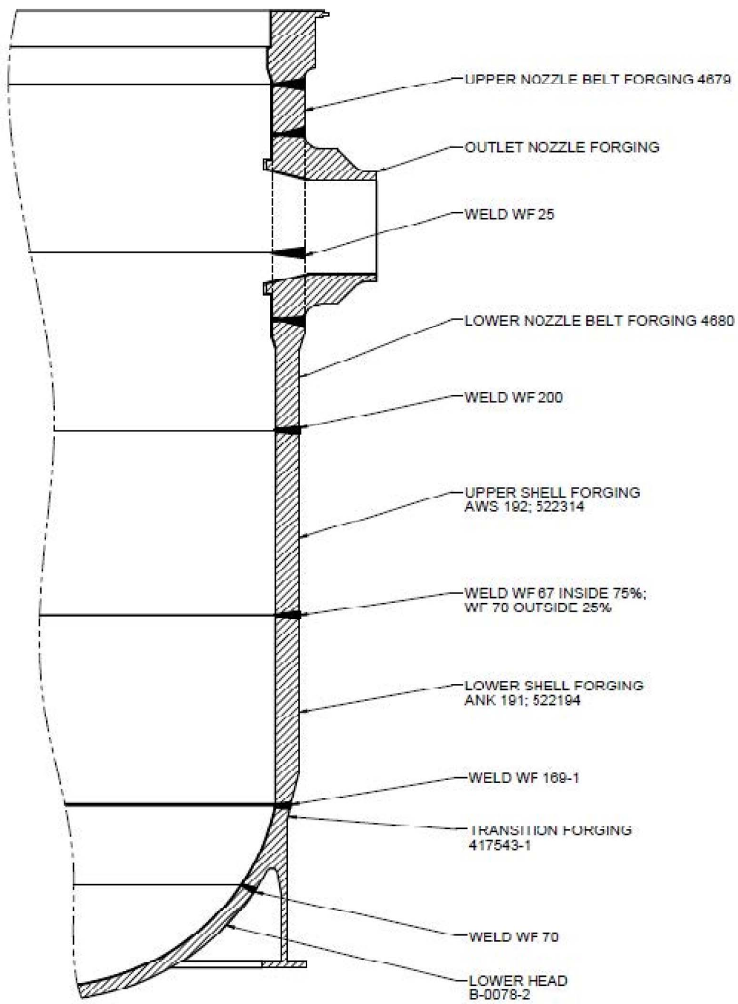


Figure 4.2-4: ONS Unit 3 Reactor Vessel Shell



4.2.1 NEUTRON FLUENCE PROJECTIONS

TLAA Description:

Neutron fluence is defined as the time integral of the neutron flux density, expressed as number of particles (neutrons) per cm^2. Neutron fluence is used as an input to quantify the change in material properties of the reactor vessel (beltline and extended beltline) regions, as required by 10 CFR 50 Appendix G and 10 CFR 50.61, over the life of the plant. Because these neutron embrittlement analyses are evaluated for the plant's service lifetime (10 CFR 50 Appendix G, IV.A.1) or end-of-life (10 CFR 50.61(a)(6)), they are identified as TLAA.

TLAA Evaluation:

The calculation based fluence analysis methodology contained in BAW-2241P-A, Revision 2 [Reference 4.2-7] is used to predict the 80-year fluence at reactor vessel shell locations. As discussed in the Oconee UFSAR, Section 18.3.19, only the ONS Unit 2 reactor vessel has installed cavity dosimetry. However, the ONS Unit 1 and ONS Unit 3 reactor vessel fluence uncertainty values are based on ONS Unit 2 cavity dosimetry results due to similar design, fabrication, operation, and fuel loading patterns. The use of the ONS Unit 2 cavity dosimetry for Oconee Unit 1 and Oconee Unit 3 was approved by the NRC in a letter to Duke Power Company dated December 5, 1988 [ADAMS Accession Number ML16152A761]. The BAW-2241P-A, Revision 2 fluence analysis methodology was developed through a full-scale benchmark experiment that was performed at the Davis Besse reactor. Results of the benchmark experiment demonstrated the accuracy of a fluence analysis that employs the methodology reported in BAW-2241P-A, Revision 2 is unbiased and has a precision within the RG 1.190, March 2001 [Reference 4.2-8] suggested one standard deviation (σ) limit of 20% for locations in the reactor vessel beltline (i.e., traditional beltline locations). Uncertainty for extended beltline locations has not been quantified in BAW-2241P-A, Revision 2.

For the Oconee Nuclear Station, neutron transport calculations, using the methodology from BAW-2241P-A, Revision 2, were completed for Cycles 27-29 for ONS Unit 1, Cycles 25-28 for ONS Unit 2, and Cycles 26-28 for ONS Unit 3, and used to project fast neutron fluence at the reactor vessel shell (i.e., beltline and extended beltline locations) to 72 EFPY. A measurement uncertainty capture uprate is conservatively factored in at 2% and is assumed at the beginning of Cycle 30 for Oconee Unit 1, Cycle 29 for Oconee Unit 2, and Cycle 29 for Oconee Unit 3.

In addition to calculation of fluence at reactor vessel shell locations, the BAW-2241P-A, Revision 2, methodology is used to calculate the fast neutron fluence (E > 1.0 MeV) exposure to the cavity dosimetry holder. The energy-dependent fast fluence rate (E > 1.0 MeV) flux exposure to the cavity dosimetry is used to determine the calculated activity of each dosimeter. Geometric detail is selected to explicitly represent the dosimeter holder and the reactor vessels. The calculated activities are adjusted for known biases (photofission, short half-life, U-235 impurity, non-leakage and non-saturation) and directly compared to measured activities. Cavity dosimetry measurements are not used in any way to determine the magnitude of the flux or the fluence. Instead, the measurements are used only to show that the calculation results are reasonable and to show that the results are consistent with the benchmark database of uncertainties relative to reactor vessel locations adjacent to the effective height of the active core also known as the traditional reactor vessel beltline.

As cavity dosimetry is exchanged, neutron transport calculations are performed for all 3 units using the methodology as described in BAW-2241P-A, Revision 2. Typical process steps are as follows.

- After cavity dosimetry is removed and exchanged, dosimetry is sent to a laboratory for testing and activation evaluation.

- Reactor vessel fluence from the prior analyzed cycles are obtained from the latest transport analyses for each unit (i.e., Cycle 26 for ONS Unit 1, Cycle 24 for ONS Unit 2, and Cycle 25 for ONS Unit 3).

- Transport calculations are performed for the reactor vessel shell for all three Oconee units and for the cavity dosimetry. The transport calculation methodology synthesizes the results of two 2-dimensional radial (RT or Rθ) and axial (RZ) discrete ordinates transport cases which use the BUGLE cross-section library. The synthesis produces a 3-dimensional flux result from the two 2-dimensional discrete ordinate transport at all reactor vessel shell locations of interest and at the cavity dosimetry locations.

- Incremental fluence is determined by multiplying the 3D synthesized fluence rate from each operating cycle by the length of each cycle (i.e., Cycles 27-29 for ONS Unit 1, Cycles 25-28 for ONS Unit 2, and Cycles 26-28 for ONS Unit 3).

- Cumulative fluence is determined by summation of incremental fluence for each cycle. Reactor vessel fluence is projected to longer time periods (e.g., 72 EFPY) to estimate the total fluence at locations of interest. This projection is performed by assuming that the average fluence at the location of interest for the projected time is at equilibrium at the average fluence rate (flux) of the last cycle analyzed for a given location of interest. This assumption is acceptable as long as future core configurations are equivalent to the core design of the last cycle analyzed. The ONS *Neutron Fluence Monitoring* AMP (B3.2, GALL-SLR X.M2) will ensure that any future core configurations are assessed relative to applicable impacts to TLAA for SLR. The end of life (72 EFPY) fluence values are determined by taking the cumulative fluence and then projecting forward by utilizing the fluence rate (flux) of the last cycle analyzed for a given location of interest.

- The weighted mean values of the ratio of calculated cavity dosimeter activities to measurements have been statistically evaluated. The standard deviation was computed, and the deviation indicates that the benchmark comparisons are consistent with the BAW-2241P-A, Revision 2 database. The consistency to the BAW-2241P-A, Revision 2 database indicates that the ONS fluence calculations have no discernible bias in the greater than 1.0 MeV fluence values. In addition, the consistency indicates that the fluence values can be represented by the BAW-2241P-A, Revision 2 reference set and the applicable standard deviation.

As the lifetime of the reactor vessel for each Oconee unit is extended to 80 years, reactor vessel regions that may be susceptible to reduction of fracture toughness may extend beyond traditional beltline locations to areas such as the reactor vessel nozzle and transition regions. As such, estimation of the fluence in reactor vessel regions adjacent to those that surround the effective height of the active core (traditional beltline) is required and the (accepted) fluence threshold for irradiation damage of reactor vessel materials, relative to the monitoring of limiting materials, is 1.0E+17 n/cm^2 (E > 1.0 MeV) [Reference 4.2-6]. For locations of interest beyond the reactor vessel regions that surround the effective height of the active core, the model developed using the methodology from BAW-2241P-A, Revision 2 is extended to provide estimates of the fluence rates, and calculated fluence at 72 EFPY, in the reactor vessel nozzle and transition regions.

For extended beltline locations, an adjustment of the method is employed to obtain best estimate cumulative (E > 1.0 MeV) fluence values. Specifically, a displacement per atom adjustment is used wherein a ratio of the discrete ordinate transport calculated displacement per atom at the extended beltline location of interest (e.g., reactor vessel nozzle) to the discrete ordinate transport calculated displacement per atom at the circumferential weld that connects the upper shell to the lower shell (SA-1585 for Unit 1, WF-25 for Unit 2, and WF-67 for Unit 3), is multiplied by the fluence at the circumferential weld to obtain the fluence at the extended beltline location of interest (e.g., reactor vessel nozzle). This adjustment factor method is shown to be conservative for extended beltline relative to recent 3-D Monte Carlo N-Particle calculations reported in Section 2.0 of Proprietary Report ANP-3898P, Revision 0 and in Section 2.0 of Non-Proprietary Report ANP-3898NP, Revision 0 [References 4.2-18 and 4.2-20, respectively] for inside surface fluence and attenuated fluence through the nozzle regions. Section 2.0 of Proprietary Report ANP-3898P, Revision 0 and in Section 2.0 of Non-Proprietary Report ANP-3898NP, Revision 0 illustrates that use of a displacement per atom at the inner surface in the nozzle region to obtain attenuated fluence, which accounts for the full neutron energy spectrum, produces significantly less attenuation at the ¼ T and ¾ T locations when compared to the Regulatory Guide 1.99 Revision 2 fluence attenuation formulation.

Based on the above discussion, neutron fluence projections at 72 EFPY are provided for Oconee Units 1, 2 and 3 in Table 4.2.1-1, Table 4.2.1-2 and Table 4.2.1-3, respectively. Inside wetted surface fluence at 72 EFPY is reported for all reactor vessel shell locations that exceed 1.0E +17 n/cm^2 (E > 1.0 MeV). Fluence is attenuated through the thickness of the shell by taking the ratio of displacement per atom at the depth in question to the displacement per atom at the inner surface, as permitted by RG 1.99, Revision 2, Section 1.1. Displacements per atom at the inner surface and at the depth in question were obtained from the discrete ordinate transport analyses described above. With regard to reactor pressure vessel embrittlement evaluation reported in subsequent SLRA sections, the following is implemented relative to extended beltline fluence.

Upper Shelf Energy

- Upper shelf energy reduction per RG 1.99, Revision 2, Positions 1.2 and 2.2 are reported in Section 4.2.2. The reactor pressure vessel inlet nozzle and outlet nozzle fluence values at the bottom of the respective nozzle to nozzle belt forging Linde 80 welds are assumed to apply to the forgings. Fluence at the ¼T location for the reactor pressure vessel nozzle forgings is determined using the conservative displacement per atom adjustment method discussed above.

- The equivalent margins analysis of the Linde 80 reactor pressure vessel nozzle welds reported in BAW-2192, Revision 0, Supplement 1P-A, Revision 0 [Reference 4.2-13] and BAW-2178, Revision 0, Supplement 1P-A, Revision 0 [Reference 4.2-14]) utilized an inside wetted surface fluence of 1.5E+18 n/cm^2. This is significantly higher than the 72 EFPY inside wetted surface fluence values for the reactor pressure vessel nozzle welds reported inTable 4.2.1-1, Table 4.2.1-2, and Table 4.2.1-3 (highest at 3.50E+17 n/cm^2). The 72 EFPY values reported herein were obtained using a conservative displacement per atom adjustment method as reported above.

- The equivalent margins analysis of the Unit 3 nozzle and transition forgings is reported in Section 4.2.2. A conservative fluence of 1.0E+18 n/cm^2 at the inside wetted surface was assumed at the reactor vessel nozzles and transition forging, with no attenuation, and the 72 EFPY upper shelf energy values at the reactor pressure vessel nozzles and transition forging were calculated using RG 1.99, Revision 2, Position 1.2 and fluence of 1.0E+18 n/cm^2. That is, no attenuation was assumed.

Pressurized Thermal Shock

- RT_{PTS} per RG 1.99, Revision 2, Positions 1.1 and 2.1 and the supplemental PTS evaluation of reactor pressure vessel nozzles are reported in Section 4.2.3. Neutron fluence at extended beltline locations (clad/base metal interface) was conservatively obtained using the displacement per atom adjustment method described above. The reactor pressure vessel inlet nozzle and outlet nozzle fluence values at the bottom of the nozzle to nozzle belt forging Linde 80 welds are assumed to apply to the forgings.

Pressure-Temperature Limits and Low Temperature Overpressure Protection

- Inside wetted surface fluence at the postulated flaw corner flaws (inside radius) of the reactor pressure vessel inlet and outlet nozzles was used. No attenuation was assumed, and inside wetted surface fluence at the flaw locations are determined using the conservative displacement per atom adjustment method discussed above.

Margins to embrittlement limits for PTS (10 CFR 50.61 using RG 1.99, Revision 2) and upper shelf energy (10 CFR 50.60 using RG 1.99, Revision 2) for extended beltline locations are much greater than traditional beltline locations and are reported in Sections 4.2.2 and 4.2.3.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii):

The fluence analyses have been projected to the end of the subsequent period of extended operation. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii). The results are to be used as inputs in the reactor vessel neutron embrittlement TLAA evaluations in Sections 4.2.2 through 4.2.5.

Table 4.2.1-1: 72 EFPY ONS Unit 1 Reactor Vessel Shell Locations With Fluence > 1.0E+17 n/cm^2 (E > 1.0 MeV)

Reactor Vessel Material	Material ID and/or Heat Number	Inside Wetted Surface Fluence (n/cm^2)	Metal/Clad Interface Fluence (n/cm^2)	¼ T (n/cm^2)	¾ T (n/cm^2)
Upper Shell (US) Plates	C3265-1, C3278-1	2.10×10^{19}	2.02×10^{19}	1.32×10^{19}	4.35×10^{18}
Lower Shell (LS) Plates	C2800-1, C2800-2	2.10×10^{19}	2.02×10^{19}	1.31×10^{19}	4.32×10^{18}
Intermediate Shell (IS) Plates	C2197-2	1.85×10^{19}	1.78×10^{19}	1.15×10^{19}	3.72×10^{18}
Lower Nozzle Belt (LNB) Forging	AHR 54; ZV 2861	2.68×10^{18}	2.60×10^{18}	1.81×10^{18}	7.91×10^{17}
Bottom of 12” Thickness of LNB Forging	AHR 54; ZV 2861	1.48×10^{18}	1.43×10^{18}	8.82×10^{17}	4.02×10^{17}
Top of 8.438” Thickness of LNB Forging	AHR 54; ZV 2861	2.19×10^{18}	2.06×10^{18}	1.41×10^{18}	7.91×10^{17}
Bottom of 8.438” Thickness of LS	C2800-1, C2800-2	9.93×10^{17}	9.59×10^{17}	7.14×10^{17}	3.80×10^{17}
Transition Forging[1]	122S347VA1	2.70×10^{17}	2.52×10^{17}	2.17×10^{17}	1.96×10^{17}
Inlet Nozzle Forging (INF) Postulated Flaw	NA	1.11×10^{17}	NA	NA	NA
Outlet Nozzle Forging (ONF) Postulated Flaw	NA	2.20×10^{17}	NA	NA	NA
LNB to Bottom of ONF Welds	8T1762; 299L44; 8T1554B	3.49×10^{17}	3.38×10^{17}	2.29×10^{17}	2.52×10^{17}

Table 4.2.1-1: 72 EFPY ONS Unit 1 Reactor Vessel Shell Locations With Fluence > 1.0E+17 n/cm^2 (E > 1.0 MeV)

Reactor Vessel Material	Material ID and/or Heat Number	Inside Wetted Surface Fluence (n/cm^2)	Metal/Clad Interface Fluence (n/cm^2)	¼ T (n/cm^2)	¾ T (n/cm^2)
LNB to Bottom of INF Welds	8T1762; 299L44; 8T1554B	1.62×10^{17}	1.57×10^{17}	1.13×10^{17}	1.73×10^{17}
LNB to IS Circumferential Weld	SA-1135	2.91×10^{18}	2.82×10^{18}	1.97×10^{18}	8.80×10^{17}
IS Longitudinal Welds (Both)	SA-1073	1.38×10^{19}	1.33×10^{19}	8.75×10^{18}	2.97×10^{18}
IS to US Circumferential Weld	SA-1229; WF 25	1.86×10^{19}	1.79×10^{19}	1.16×10^{19}	3.79×10^{18}
LS to US Circumferential Weld	SA-1585	2.05×10^{19}	1.97×10^{19}	1.29×10^{19}	4.30×10^{18}
US Longitudinal Welds (Both)	SA-1493	1.36×10^{19}	1.31×10^{19}	8.58×10^{18}	2.94×10^{18}
LS Longitudinal Weld (Both)	SA-1426, SA-1430	1.68×10^{19}	1.62×10^{19}	1.07×10^{19}	3.59×10^{18}
LS to Transition Circumferential Weld	WF-9	2.70×10^{17}	2.52×10^{17}	2.17×10^{17}	1.96×10^{17}

Note 1: Values are the same as the LS to Transition Forging Circumferential Weld

Table 4.2.1-2: 72 EFPY ONS Unit 2 Reactor Vessel Shell Locations With Fluence > 1.0E+17 n/cm^2 (E > 1.0 MeV)

Reactor Vessel Material	Material ID and/or Heat Number	Inside Wetted Surface Fluence (n/cm^2)	Metal/Clad Interface Fluence (n/cm^2)	¼ T (n/cm^2)	¾ T (n/cm^2)
Upper Shell (US) Forging	AAW 163; 3P2359	1.98×10^{19}	1.90×10^{19}	1.24×10^{19}	4.14×10^{18}
Lower Shell (LS) Forging	AWG 164; 4P1885	1.97×10^{19}	1.89×10^{19}	1.24×10^{19}	4.10×10^{18}
Lower Nozzle Belt (LNB) Forging	AMX 77; 123T382	1.74×10^{19}	1.67×10^{19}	1.09×10^{19}	3.52×10^{18}
Bottom of 12” Thickness of LNB Forging	AMX 77; 123T382	1.70×10^{18}	1.66×10^{18}	1.04×10^{18}	3.70×10^{17}
Top of 8.438” Thickness of LNB Forging	AMX 77; 123T382	2.42×10^{18}	2.32×10^{18}	1.62×10^{18}	7.45×10^{17}
Bottom of 8.438” Thickness of LS	AWG 164; 4P1885	9.19×10^{17}	8.87×10^{17}	6.63×10^{17}	3.58×10^{17}
Transition Forging[1]	122T293VA1	2.50×10^{17}	2.34×10^{17}	2.02×10^{17}	1.84×10^{17}
Inlet Nozzle Forging (INF) Postulated Flaw	NA	1.03×10^{17}	NA	NA	NA
Outlet Nozzle Forging (ONF) Postulated Flaw	NA	2.04×10^{17}	NA	NA	NA
LNB to Bottom of ONF Welds	8T1762; 72445	3.24×10^{17}	3.14×10^{17}	2.13×10^{17}	2.41×10^{17}

Table 4.2.1-2: 72 EFPY ONS Unit 2 Reactor Vessel Shell Locations With Fluence > 1.0E+17 n/cm^2 (E > 1.0 MeV)

Reactor Vessel Material	Material ID and/or Heat Number	Inside Wetted Surface Fluence (n/cm^2)	Metal/Clad Interface Fluence (n/cm^2)	¼ T (n/cm^2)	¾ T (n/cm^2)
LNB to Bottom of INF Welds	8T1762; 72445	1.50×10^{17}	1.46×10^{17}	1.06×10^{17}	1.67×10^{17}
LNB to US Circ. Weld	WF 154	1.75×10^{19}	1.68×10^{19}	1.09×10^{19}	3.59×10^{18}
LS to US Circ. Weld	WF 25	1.92×10^{19}	1.85×10^{19}	1.22×10^{19}	4.08×10^{18}
LS to Transition Circ. Weld	WF 112	2.50×10^{17}	2.34×10^{17}	2.02×10^{17}	1.84×10^{17}

Note 1: Values are the same as the LS to Transition Forging Circumferential Weld

Table 4.2.1-3: 72 EFPY ONS Unit 3 Reactor Vessel Shell Locations With Fluence > 1.0E+17 n/cm^2 (E > 1.0 MeV)

Reactor Vessel Material	Material ID and/or Heat Number	Inside Wetted Surface Fluence (n/cm^2)	Metal/Clad Interface Fluence (n/cm^2)	¼ T (n/cm^2)	¾ T (n/cm^2)
Upper Shell (US) Forging	AWS 192; 522314	2.06×10^{19}	1.98×10^{19}	1.30×10^{19}	4.30×10^{18}
Lower Shell (LS) Forging	ANK 191; 522194	2.05×10^{19}	1.97×10^{19}	1.29×10^{19}	4.26×10^{18}
Lower Nozzle Belt (LNB) Forging	4680	1.81×10^{19}	1.74×10^{19}	1.13×10^{19}	3.66×10^{18}
Bottom of 12” Thickness of LNB Forging	4680	1.81×10^{18}	1.77×10^{18}	1.11×10^{18}	3.87×10^{17}
Top of 8.438” Thickness of LNB Forging	4680	2.58×10^{18}	2.48×10^{18}	1.72×10^{18}	7.86×10^{17}
Bottom of 8.438” Thickness of LS	ANK 191; 522194	9.80×10^{17}	9.45×10^{17}	7.06×10^{17}	3.75×10^{17}
Transition Forging[1]	417543-1	2.68×10^{17}	2.50×10^{17}	2.15×10^{17}	1.95×10^{17}
Inlet Nozzle Forging (INF) Postulated Flaw	NA	1.14×10^{17}	NA	NA	NA
Outlet Nozzle Forging (ONF) Postulated Flaw	NA	2.21×10^{17}	NA	NA	NA
LNB to Bottom of ONF Welds	72105; 406L44	3.50×10^{17}	3.39×10^{17}	2.30×10^{17}	2.51×10^{17}
LNB to Bottom of INF Welds	72105; 72102; 82102	1.62×10^{17}	1.58×10^{17}	1.14×10^{17}	1.73×10^{17}

Table 4.2.1-3: 72 EFPY ONS Unit 3 Reactor Vessel Shell Locations With Fluence > 1.0E+17 n/cm^2 (E > 1.0 MeV)

Reactor Vessel Material	Material ID and/or Heat Number	Inside Wetted Surface Fluence (n/cm^2)	Metal/Clad Interface Fluence (n/cm^2)	¼ T (n/cm^2)	¾ T (n/cm^2)
LNB to US Circ. Weld	WF 200	1.82×10^{19}	1.75×10^{19}	1.14×10^{19}	3.74×10^{18}
LS to US Circ. Weld	WF 67; WF 70	2.01×10^{19}	1.93×10^{19}	1.27×10^{19}	4.24×10^{18}
LS to Transition Circ. Weld	WF 169-1	2.68×10^{17}	2.50×10^{17}	2.15×10^{17}	1.95×10^{17}

Note 1: Values are the same as the LS to Transition Forging Circumferential

4.2.2 UPPER-SHELF ENERGY

TLAA Description:

Appendix G of 10 CFR 50.60, [Reference 4.2-11], requires that reactor vessel beltline materials *"must have Charpy upper-shelf energy in the transverse direction for base metal and along the weld for weld material according to the ASME Code, of no less than 75 ft-lb (102 J) initially and must maintain Charpy upper-shelf energy throughout the life of the vessel of no less than 50 ft-lb (68 J) unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation or Director, Office of New Reactors, as appropriate, that the lower values of Charpy upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code."* The CLB upper-shelf energy calculations were prepared for the Oconee reactor vessel beltline materials for 54 EFPY as discussed in Section 4.2. Since upper-shelf energy reduction is a function of the 54 EFPY fluence, which is associated with the 60-year licensed operating period, the upper-shelf energy calculations meet the criteria of 10 CFR 54.3(a) and have been identified as TLAA requiring evaluation for 80 years.

TLAA Evaluation:

For SLR, the upper-shelf energy values for the traditional beltline and extended beltline materials were determined for the ONS reactor vessel beltline and extended beltline items using methods consistent with RG 1.99, Revision 2 [Reference 4.2-12]. Two methods may be used to predict the decrease in upper-shelf energy with irradiation, depending on the availability of credible surveillance capsule data as defined in RG 1.99, Revision 2. For vessel beltline materials that are not in the surveillance program or for locations with non-credible data, the Charpy upper-shelf energy is assumed to decrease as a function of fluence and copper content, as indicated in RG 1.99, Revision 2 (Position 1.2). When two or more credible surveillance data sets are available from the reactor, they may be used to determine the Charpy upper-shelf energy of the surveillance material. The surveillance data are then used in conjunction with the regulatory guide to predict the change in upper-shelf energy of the reactor vessel material due to irradiation (Position 2.2).

Copper content and initial upper shelf energy for extended beltline locations have not previously been reported to the NRC and are derived in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0. Material properties for traditional beltline locations are in general consistent with the 60-year current licensing basis neutron embrittlement evaluations that comply with 10 CFR 50 Appendix G; however, differences that result in increased margins to embrittlement limits (e.g., decrease in Copper wt% or increase in initial upper-shelf energy) are derived in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0.

The 72 EFPY RG 1.99, Revision 2 (Position 1.2) upper-shelf energy values of the vessel materials are predicted using the corresponding ¼T fluence projection, copper content of the materials provided in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0 and Figure 2 in RG 1.99, Revision 2. The predicted Position 2.2 upper-shelf energy values are determined for the reactor vessel materials that are contained in the surveillance program by using surveillance data along with the corresponding ¼T fluence projection.

The ¼T fluence projections are ¼T displacement per atom adjusted values for Oconee are reported in Table 3-6 for Unit 1, Table 3-7 for Unit 2 and Table 3-8 for Unit 3 within Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0 unless the attenuation of fluence from the inside wetted surface using RG 1.99, Revision 2, Equation (3), $f = f_{surf}\ (e^{-0.24\ x})$ exceeds the ¼T displacement per atom adjusted values. The projected upper-shelf energy values were calculated to determine if the Oconee Units 1, 2, and 3 beltline and extended beltline materials remain above the 50 ft-lb limit at 72 EFPY.

All ONS Unit 1 reactor vessel beltline and extended beltline plate and forging materials maintain an upper-shelf energy value greater than 50 ft-lbs at 72 EFPY (Table 3-6 of Proprietary Report ANP-3898P, Revision 0 and Table 3-6 of Non-Proprietary Report ANP-3898NP, Revision 0). All ONS Unit 1 reactor vessel beltline and extended beltline Linde 80 welds have upper-shelf energy values less than 50 ft-lbs at 72 EFPY and require an equivalent margins analysis to demonstrate that lower values of Charpy upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

All ONS Unit 2 reactor vessel beltline and extended beltline forging materials maintain an upper-shelf energy value greater than 50 ft-lbs at 72 EFPY (Table 3-7 of Proprietary Report ANP-3898P, Revision 0 and Table 3-7 of Non-Proprietary Report ANP-3898NP, Revision 0). All ONS Unit 2 reactor vessel beltline and extended beltline Linde 80 welds have upper-shelf energy values less than 50 ft-lbs at 72 EFPY and require an equivalent margins analysis to demonstrate that lower values of Charpy upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

All ONS Unit 3 reactor vessel beltline and extended beltline forging materials maintain an upper-shelf energy value greater than 50 ft-lbs at 72 EFPY (Table 3-8 of Proprietary Report ANP-3898P, Revision 0 and Table 3-8 of Non-Proprietary Report ANP-3898NP, Revision 0) with the exception of the reactor vessel inlet and outlet nozzle forgings and the transition forging. All reactor vessel beltline and extended beltline Linde 80 welds have upper-shelf energy values less than 50 ft-lbs at 72 EFPY. The reactor vessel inlet and outlet nozzle forgings, transition forging, and traditional beltline and extended beltline Linde 80 welds require an equivalent margins analysis to demonstrate that lower values of Charpy upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

Equivalent Margins Analysis: Linde 80 Welds

The ASME Section XI, acceptance criteria for Levels A through D Service Loadings for Oconee Units 1, 2, and 3 reactor vessel beltline and extended beltline Linde 80 welds are satisfied and are reported in Framatome reports BAW-2192, Revision 0, Supplement 1P-A, Revision 0, *Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W owners reactor vessel working group for Levels A & B Service Loads* [Reference 4.2-13], and BAW-2178, Revision 0, Supplement 1P-A, Revision 0, *Low Upper-shelf Toughness Fracture Mechanics Analysis Of Reactor Vessels Of B&W Owners Reactor Vessel Working Group For Levels C & D Service Loads* [Reference 4.2-14]. These reports contain equivalent margins analyses for all Oconee Units 1, 2, and 3 Linde 80 welds identified as beltline and extended beltline material for 80 years.

Duke Energy has confirmed that the 80-year inside wetted surface fluence values reported in Table 3-1 of BAW-2178, Supplement 1P-A, and Table 3-1 of BAW-2192, Supplement 1P-A bound the 72 EFPY fluence values reported in Table 3-6, Table 3-7, and Table 3-8 of Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0, with the exception of ONS Unit 1 weld SA-1135, circumferential weld that connects the lower nozzle belt forging to the intermediate shell. Note that the equivalent margins analyses reported in the topical reports conservatively utilized 80-year fluence values of at least an order of magnitude higher than the 72 EFPY nozzle fluence reported in Table 3-6, Table 3-7, and Table 3-8 of Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0. In addition, the weld chemistry data reported in Table 3-1 of BAW-2178, Revision 0, Supplement 1P-A, and Table 3-1 of BAW-2192, Revision 0, Supplement 1P-A, Revision 0 is consistent with weld chemistry copper content reported in Table 3-6 of Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0 for ONS Unit 1; Table 3-7 of Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0 for ONS Unit 2; and Table 3-8 of Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0 for ONS Unit 3.

The level C and D limiting design transients reported in Section 4.3.2 of BAW-2178, Revision 0, Supplement 1P-A, Revision 0 are applicable to Oconee units and are based on a review of the Oconee ASME Section III reactor vessel design specification transients and the UFSAR Chapter 15 events relative to transients that would result in the highest thermal stresses coupled with pressure stresses relative to the equivalent margins analysis satisfies RG 1.161, June 1995 [Reference 4.2-15] with respect to Level C and D transient selection. The materials of construction, reactor vessel geometry, and range of explanatory variables for the J-R model (Section A.5 of BAW-2192, Revision 0, Supplement 1P-A, Revision 0) reported in the topical reports are confirmed to be applicable to Linde 80 beltline and extended beltline welds at Oconee Units 1, 2 and 3.

As such, Duke Energy has confirmed that Oconee Units 1, 2, and 3 are bounded by the topical reports BAW-2178, Revision 0, Supplement 1P-A, Revision 0, and BAW-2192, Revision 0, Supplement 1P-A, Revision 0 relative to fluence (with the exception of Oconee Unit 1 weld SA-1135), weld chemistry, geometry, materials of construction, design transients and the J-R model applicability. The results of the Oconee Units 1, 2, and 3 equivalent margins analysis as reported in BAW-2178, Revision 0, Supplement 1P-A, Revision 0 and BAW-2192, Revision 0, Supplement 1P-A, Revision 0, are summarized below as well as a reconciliation for ONS Unit 1 weld SA-1135.

Levels A & B Service Loadings

Reactor Vessel Shell Welds (Beltline)

The limiting reactor vessel shell weld is Oconee Unit 1 axial weld SA-1073.

- With factors of safety of 1.15 on pressure and 1.0 on thermal loading, the applied J-integral (J_1) is less than the J-integral of the material at a ductile flaw extension of 0.10 in. ($J_{0.1}$). The ratio $J_{0.1}/J_1$ is greater than the required value of 1.0.

- With a factor of safety of 1.25 on pressure and 1.0 on thermal loading, flaw extensions are ductile and stable since the slope of the applied J-integral curve is less than the slope of the lower bound J-R curve at the point where the two curves intersect.

- Oconee Unit 1 weld SA-1135 was evaluated in BAW-2192, Revision 0, Supplement 1P-A, Revision 0, at a fluence of 1.90 $x10^{18}$ n/cm^2 yet the fluence for weld SA-1135 is reported in Table 4.2.1-1 as $2.91x10^{18}$ n/cm^2. Therefore, an equivalent margins analysis reconciliation was performed for this weld at a fluence of $2.91x10^{18}$ n/cm^2. The ratio $J_{0.1}/J_1$ for weld SA-1135 decreased slightly, is greater than the required value of 1.0, and flaw extensions remain ductile and stable. The limiting weld remains Oconee Unit 1 axial weld SA-1073 as reported in BAW-2192, Revision 0, Supplement 1P-A, Revision 0.

<u>Reactor Vessel Transition Welds and Reactor Vessel Nozzle Welds (Extended Beltline)</u>

The limiting weld for ONS Units 1, 2, and 3 considering reactor vessel transition welds (upper and lower) and the reactor vessel inlet and outlet nozzle-to-shell welds is the reactor vessel outlet nozzle to nozzle belt forging weld.

- With factors of safety of 1.15 on pressure and 1.0 on thermal loading, the applied J-integral (J_1) is less than the J-integral of the material at a ductile flaw extension of 0.10 in. ($J_{0.1}$). The ratio $J_{0.1}/J_1$ is greater than the required value of 1.0.

- With a factor of safety of 1.25 on pressure and 1.0 on thermal loading, flaw extensions are ductile and stable since the slope of the applied J-integral curve is less than the slope of the lower bound J-R curve at the point where the two curves intersect.

<u>Levels C & D Service Loadings</u>

<u>Reactor Vessel Shell Welds (Beltline)</u>

The limiting weld among the Oconee reactor vessel shell welds is Oconee Unit 1 longitudinal weld SA-1073. The limiting transient for Level C & D service Loads is the hot leg LOCA.

- With a factor of safety of 1.0 on loading, the applied J-integral (J_1) for the limiting reactor vessel shell weld (Oconee Unit 1, SA-1073) is less than the lower bound J-integral of the material at a ductile flaw extension of 0.10 inch ($J_{0.1}$) with a ratio $J_{0.1}/J_1$ that is greater than the required value of 1.0.

- With a factor of safety of 1.0 on loading, flaw extensions are ductile and stable for the limiting reactor vessel shell weld (SA-1073) since the slope of the applied J-integral curve is less than the slopes of both the lower bound and mean J-R curves at the points of intersection.

- For weld SA-1073 it was demonstrated that flaw growth is stable at much less than 75% of the vessel wall thickness. It has also been shown that the remaining ligament is sufficient to preclude tensile instability.

Reactor Vessel Transition Welds and Reactor Vessel Nozzle Welds (Extended Beltline)

The reactor vessel inlet and outlet nozzle-to-shell welds were evaluated for Levels C and D Service Loadings. The limiting transient for Level C & D service loads is the hot leg LOCA. ONS Unit 1 upper transition weld SA-1135 along with the lower transition welds in each of the Oconee units reactor vessels are bounded by the limiting Unit 1 reactor vessel shell weld SA-1073. This conclusion remains valid considering the higher fluence associated with ONS Unit 1 weld SA-1135 reported in Section 4.2.1. As such, only the reactor vessel nozzle-to-shell welds are addressed herein.

- With a factor of safety of 1.0 on loading, the applied J-integral (J_1) for the reactor vessel nozzle-to-shell welds is less than the lower bound J-integral of the material at a ductile flaw extension of 0.10 inch ($J_{0.1}$). All ratios are greater than 1.0.

- With a factor of safety of 1.0 on loading, flaw extensions are ductile and stable for the reactor vessel nozzle-to-shell welds.

- For the reactor vessel nozzle-to-shell welds it was demonstrated that flaw growth is stable at much less than 75% of the vessel wall thickness. It has also been shown that the remaining ligament is sufficient to preclude tensile instability.

Equivalent Margins Analysis: ONS Unit 3 Reactor Vessel Outlet Nozzles and Transition Forging

As reported in Proprietary Report ANP-3898P, Revision 0, Table 3-8 and in Non-Proprietary Report ANP-3898NP, Revision 0, Table 3-8, the Oconee Unit 3 reactor vessel outlet nozzle forgings and Oconee Unit 3 transition forging have predicted 72 EFPY upper-shelf energy values that are either not defined (i.e., reactor vessel outlet nozzles) or are below 50 ft-lbs at 80 years (i.e., transition forging); all remaining beltline and extended beltline plate and forging materials for Units 1, 2, and 3 are above 50 ft-lbs at 72 EFPY. The Oconee Unit 3 reactor vessel outlet nozzle forgings (2) and the transition forging (1) were procured from Klockner-Werke, are extended beltline materials for SLR, and Charpy V-Notch (CVN) testing on the upper shelf was not required by the construction code for these forgings. Therefore, 72 EFPY equivalent margins analyses are required for the ONS Unit 3 reactor vessel outlet nozzle forgings and Oconee Unit 3 transition forging to demonstrate compliance with 10 CFR 50, Appendix G, for subsequent license renewal.

The analytical procedure used for the 72 EFPY equivalent margins analyses of the Oconee Unit 3 reactor vessel outlet nozzle forgings and transition forging are in accordance with ASME Section XI, Appendix K, 2017 Edition, with selection of design transients based on the guidance in RG 1.161 [Reference 4.2-15]. Selection of design transients and the methodology for calculation of applied J-integrals for the reactor vessel outlet nozzles and transition forging are consistent with the methodology used to calculate applied J-integrals for Linde 80 welds [Reference 4.2-13, Reference 4.2-14]. Both axial and circumferential flaws are postulated in the reactor vessel outlet nozzle and transition forgings as required by ASME Section XI. The J-integral resistance model is from NUREG/CR-5729 [Reference 4.2-16], i.e., reactor vessel J_d base metal models reported in Table 11, Charpy Model and CVN_P model. The J-integral resistance models (Charpy Model or CVN_P) that provides the most conservative J-integral resistance at a crack extension of 0.10 inches was selected for each evaluation. In order to utilize the NUREG/CR-5729 base metal J_d Charpy and CVN_P models, initial unirradiated upper shelf energy must be established for these extended beltline forgings procured from Klockner-Werke.

Unirradiated Upper Shelf Energy-Transition Forging and Reactor Vessel Nozzles

By letter dated February 27, 2014, NRC issued new Technical Specification pressure-temperature limits applicable to 54 EFPY for ONS [Reference 4.2-4]. As part of the review of the technical basis for proposed pressure-temperature curves, the Oconee Unit 3 transition forging unirradiated upper-shelf energy was established. As discussed in the SER, additional information (ADAMS Accession number ML13350A098) was provided to the NRC wherein the unirradiated upper-shelf energy of 59.2 ft-lbs in the weak direction is reported for the Oconee Unit 3 transition forging. This value is not a measured upper shelf energy but was obtained as follows.

Data taken from the actual reactor vessel certified material test report where limited CVN test data were performed at a single test temperature (+10 °F) to confirm that at least 30 ft-lbs was obtained for the material. CVN test data does not represent the impact energy upper-shelf (i.e., >95% shear), but is a mean value of 91.1 ft-lbs in the strong direction taken at a reduced percent shear fracture and is a conservative estimate of the upper-shelf energy in that the impact energy will increase as the percent shear fracture increases. This test report data was conservatively considered to be in the strong direction and the mean value of the reported CVN data at +10 °F was multiplied by 65% to obtain 59.2 ft-lbs in the weak direction.

Unirradiated upper-shelf energy for the Oconee reactor vessel outlet nozzle forgings procured from Klockner-Werke is not available from the certified material test report and was conservatively estimated at 78 ft-lbs in the strong direction and 52 ft-lbs in the weak direction based on the data reported in PWROG-17090-NP-A, Revision 0, *Generic Rotterdam Forging and Weld Initial Upper-Shelf Energy Determination* [Reference 4.2-17]. The mean minus 2 standard deviations upper-shelf energy, in the strong and weak directions, for Fried-Krupp Huttenwerke AG Forgings reported in Table 6 were conservatively assumed to apply to the Klockner-Werke forgings. This assumption is justified based on review of PWROG-17090-NP-A, Revision 0, Table 7, wherein use of actual Klockner-Werke measured data and statistical mean in the strong direction minus 2 standard deviations would result in an unirradiated upper-shelf energy greater than 78 ft-lbs.

The NUREG/CR-5729 reactor vessel J_d base metal Charpy model requires upper shelf energy at 72 EFPY as input. As such, a conservative fluence of 1.0E+18 n/cm^2 at the inside wetted surface was assumed at the reactor vessel nozzles and transition forging, with no attenuation, and the 72 EFPY upper-shelf energy values at the reactor vessel nozzles and transition forging were calculated using RG 1.99, Position 2.1. The NUREG/CR-5729 reactor vessel J_d CVN_p model requires unirradiated upper shelf energy, discussed above, and fluence (assumed at 1.0E+18 n/cm^2) as inputs. The estimate of 72 EFPY fluence of 1.0E+18 n/cm^2 is conservative relative to that reported in Table 4.2.1-3 for the Oconee reactor vessel outlet nozzles and the transition forging. The copper content of the Oconee Unit 3 reactor vessel nozzles and transition forging are reported in Reference 4.2-18.

Applicability of NUREG/CR-5729 J-Integral Resistance Models

The explanatory variables used to develop the reactor vessel J_d base metal models (Charpy and CVN_p) are reported in NUREG/CR-5729, Table 2. The ONS Unit 3 reactor vessel nozzle and transition forgings have material properties (unirradiated and at 72 EFPY - i.e., fluence, temperature, and CVN) within the range of these explanatory variables [Reference 4.2-18]. Therefore, NUREG/CR-5729 reactor vessel J_d base metal Charpy Model and CVN_p J-integral resistance models may be applied to the ONS Unit 3 reactor vessel nozzle and transition forgings for SLR.

Results of the equivalent margins analysis for the ONS Unit 3 reactor vessel outlet nozzles and transition forging are reported in [Reference 4.2-18] and are summarized below.

Levels A & B Service Loads

- The applied J-integral values for the assumed ¼-thickness inside-surface circumferential and axial flaws in the reactor vessel outlet nozzles (with the exception that a 3-inch flaw is postulated at the nozzle inside radius, which is substantially greater than the allowable planar flaw per the inservice inspection standards given in Table IWB-3512-1) and in the transition forging with a structural factor of 1.15 on pressure loading is within the material fracture toughness J-resistance at 0.1 inch crack extension. The ratio $J_{0.1}/J_1$ is greater than the required value of 1.0 for both the axial and circumferential postulated flaws in both the reactor vessel outlet nozzle and transition forging. The limiting flaw is an axial flaw in the reactor vessel outlet nozzle, since this location reports the limiting (lowest) $J_{0.1}/J_1$ ratio.

- With a structural factor of 1.25 on pressure and 1.0 on thermal loading, flaw extensions are ductile and stable since the slope of the applied J-integral curve is less than the slope of the lower bound J-R curve for crack extensions less than or equal to 0.10 inches.

Levels C & D Service Loads

Consistent with BAW-2178, Revision 0, Supplement 1P-A, Revision 0, only the limiting location (i.e., reactor vessel outlet nozzle forging), considering Levels A & B service loads, is evaluated for Levels C & D Service Loads.

- With a structural factor of 1.0 on loading, the applied J-integral (J_1) for the reactor vessel outlet nozzle forging postulated axial and circumferential flaws are less than the lower bound J-integral of the material at a ductile flaw extension of 0.10 inch ($J_{0.1}$) with a ratio $J_{0.1}/J_1$ is greater than the required value of 1.0.

- With a structural factor of 1.0 on loading, flaw extensions are ductile and stable for the reactor vessel outlet nozzle forging postulated circumferential and axial flaws since the slopes of the applied J-integral curves are less than the slopes of the lower bound J-R curves for crack extensions less than or equal to 0.10 inches.

- For the postulated reactor vessel outlet nozzle forging circumferential and axial flaws, flaw growth is stable at much less than 75% of the vessel wall thickness. Also, the remaining ligament is sufficient to preclude tensile instability by a large margin.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii):

The Oconee Units 1, 2, and 3 upper-shelf energy analyses have been projected to the end of the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(ii).

4.2.3 PRESSURIZED THERMAL SHOCK

TLAA Description:

10 CFR 50.61(b)(1) [Reference 4.2-19] provides rules for protection against pressurized thermal shock events for pressurized water reactors. Licensees are required to perform an assessment of the projected values of reference temperature whenever a significant change occurs in projected values of RT_{PTS} or upon request for a change in the expiration date for the operation of the facility. For SLR, RT_{PTS} values are calculated at 72 EFPY for Oconee Units 1, 2, and 3.

TLAA Evaluation:

10 CFR 50.61(c) provides two methods for determining RT_{PTS}. These methods are also described in Section 1.1 (i.e., Position 1.1) and Section 2.1 (i.e., Position 2.1) of Regulatory Guide 1.99, Revision 2 [Reference 4.2-12]. Position 1.1 applies for material without credible surveillance data available and Position 2.1 is used for material with two or more credible surveillance data sets available. The RT_{PTS} values are calculated for both Positions 1.1 (all 3 units) and 2.1 (ONS Unit 3 only) by following the guidance in RG 1.99, Revision 2, using the copper and nickel content of the Units 1, 2, and 3 reactor vessel materials, and subsequent period of extended operation fluence projections at 72 EFPY.

Copper content, nickel content, and initial RT_{NDT}, including standard deviation for initial RT_{NDT}, for extended beltline locations have not previously been reported to the NRC and are derived in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0. Material properties for traditional beltline locations are in general consistent with the 60-year current licensing basis neutron embrittlement evaluations that comply with 10 CFR 50.61; however, differences that result in increased margins to embrittlement limits (e.g., decrease in Copper weight%) are derived in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0.

The 10 CFR 50.61(c) accepted methods and the material properties reported in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0 were used with the base metal/clad interface fluence values reported in Tables 4.2.1-1 through 4.2.1-3 above to calculate the following RT_{PTS} values for Oconee Units 1, 2, and 3 reactor vessel materials at 72 EFPY. The subsequent period of extended operation RT_{PTS} calculations are summarized in Table 5-10, Table 5-11, and Table 5-12 that are provided in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0 for Oconee Units 1, 2, and 3, respectively.

10 CFR 50.61(b)(2) establishes screening criteria for RT_{PTS} as 270°F for plates, forgings, and longitudinal welds and 300°F for circumferential welds. All of the ONS Units 1, 2, and 3 reactor vessel materials are below the RT_{PTS} screening criteria values of 270°F for base metal and longitudinal welds, and 300°F for circumferentially oriented welds through the subsequent period of extended operation. For Unit 1, the limiting materials are axial welds SA-1426 and SA-1430 with a projected value of RT_{PTS} at 72 EFPY of 207.2°F (screening criterion of 270°F). For Unit 2, the limiting material is circumferential weld WF-25 with a projected value of RT_{PTS} at 72 EFPY of

245.1°F (screening criterion of 300°F). For Unit 3, the limiting material is circumferential weld WF-67 with a projected value of RT_{PTS} at 72 EFPY of 240.2°F (screening criterion of 300°F).

The Oconee Units 1, 2, and 3 reactor pressure vessel materials remain below the 10 CFR 50.61 screening criteria at 72 EFPY.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii):

The Oconee Units 1, 2, and 3 PTS analyses, utilizing 10 CFR 50.61 for traditional and extended beltline locations have been projected to the end of the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(ii).

4.2.4 PRESSURE-TEMPERATURE LIMITS

TLAA Description:

10 CFR 50 Appendix G requires that the reactor vessel be maintained within established pressure-temperature limits, including heatup and cooldown operations. These limits specify the maximum allowable pressure as a function of reactor coolant temperature. As the reactor vessel is exposed to increased neutron irradiation, its fracture toughness is reduced. The pressure-temperature limits must account for the anticipated reactor vessel fluence. The current ONS 54 EFPY pressure-temperature limits are based upon fluence projections for 60 years of plant operation [Reference 4.2-4]. Because they were based upon a fluence assumption of 60 years of operation, the pressure-temperature limits analyses meet the definition of 10 CFR 54.3(a) and have been identified as TLAA.

TLAA Evaluation:

Heatup and cooldown limit curves are calculated using the most limiting value of RT_{NDT} corresponding to the limiting material in the beltline region of the reactor vessel. The most limiting RT_{NDT} of the material in the beltline of the reactor vessel is determined by using the unirradiated reactor vessel material fracture toughness properties and estimating the irradiation induced shift (ΔRT_{NDT}). RT_{NDT} increases as the material is exposed to fast neutron irradiation; therefore, to find the most limiting RT_{NDT} at any time, ΔRT_{NDT} due to neutron radiation exposure associated with that time, plus a margin term, must be added to the original unirradiated RT_{NDT}. The resulting value, called the adjusted reference temperature, is used to determine pressure-temperature limit curves in accordance with the requirements of 10 CFR Part 50, Appendix G.

Pressure-temperature limits (54 EFPY) for the ONS units reactor vessels were developed in accordance with the requirements of 10 CFR Part 50, Appendix G, utilizing the analytical methods and flaw acceptance criteria of topical report BAW-10046A, Revision 2 [Reference 4.2-23], and ASME Code Section XI, Appendix G (1998 Edition with Addenda through 2000, which permits use of K_{Ic}). As reported in the ONS measurement uncertainty recapture SER [Reference 4.2-33], the EFPY applicability of the ONS 54 EFPY pressure-temperature limits was reduced as follows: ONS Unit 1 to 44.6 EFPY, ONS Unit 2 to 45.3 EFPY, and ONS Unit 3 to 43.8 EFPY. The approximate 10 EFPY reduction in the applicability of the pressure-temperature limit curves is not due solely to the small increase in fluence from measurement uncertainty recapture, but is primarily due to consideration of NRC RIS 2014-11, *"Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components,"* and the need to consider extended beltline materials [Reference 4.2-6]. As such, the EFPY applicability was reduced until the reactor vessel nozzle fluence reached 1.0E+17 n/cm^2 (E > 1.0 MeV).

In accordance with NUREG-2192 [Reference 4.2-26], Section 4.2.2.1.4, the P-T limits for the SPEO need not be submitted as part of the SLRA since the pressure-temperature limits are required to be updated through the 10 CFR 50.90 licensing process when necessary for pressure-temperature limits that are located in the Technical Specifications. The CLB will ensure that the pressure-temperature limits for the SPEO will be updated prior to exceeding the EFPY for which they remain valid.

Consistent with the Oconee 60-year license renewal application, NUREG-1723 [Reference 4.2-3], Section 4.2.4.3.1, Duke Energy prepared 72 EFPY (equivalent to 80 years of operation) pressure-temperature limits to demonstrate that the predicted operating window is sufficient to conduct heatups and cooldowns. The 72 EFPY pressure-temperature limits were developed with consideration of traditional and extended beltline materials (i.e., locations where reactor vessel neutron fluence > 1.0E+17 n/cm^2, E > 1 MeV) using the analytical methods and flaw acceptance criteria of topical report BAW-10046A, Revision 2 and ASME Code Section XI, Appendix G (2013 Edition, which permits use of K_{Ic}).

Copper content, nickel content, and initial RT_{NDT}, including standard deviation for initial RT_{NDT}, for extended beltline locations have not previously been reported to the NRC and are derived in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0. Material properties for traditional beltline locations are in general consistent with the 60-year current licensing basis neutron embrittlement evaluations that comply with 10 CFR 50 Appendix G; however, differences that result in increased margins to embrittlement limits (e.g., decrease in Copper weight %, decrease in initial RT_{NDT}, or decrease in margin) are derived in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0. The full set of adjusted reference temperatures for traditional and extended beltline locations are reported in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0.

Geometric discontinuities at the lower shell to lower transition forging and the nozzle belt forging to intermediate/upper shell (i.e., taper transition regions) were not explicitly modeled for the development of the ONS 72 EFPY pressure-temperature limits. However, to support 60-year pressure-temperature limits for a B&W designed plant, detailed 2-D ANSYS finite element models were prepared to evaluate the impact of taper transition on pressure-temperature limits. The taper transition region pressure-temperature limits were compared to the existing uncorrected 60-year pressure-temperature limits and the existing limits were found to be more restrictive.

Limiting materials relative to adjusted reference temperatures at 54 EFPY (measurement uncertainty recapture submittal maintained the 54 EFPY pressure-temperature limit curves and reduced their EFPY applicability) and 72 EFPY are reported in Table 4.2.4-1 for Oconee Unit 1, Table 4.2.4-2 for Oconee Unit 2, and Table 4.2.4-3 for Oconee Unit 3. The 72 EFPY adjusted reference temperatures are higher than the 54 EFPY adjusted reference temperatures, with the exception of the lower shell to transition forging, at all locations for Oconee Unit 1. The 72 EFPY adjusted reference temperatures are higher than the 54 EFPY adjusted reference temperatures at all locations for Oconee Unit 2 with the exception of the lower shell to transition forging weld and nozzle belt forging AMX-77; the reduction in adjusted reference temperature for AMX-77 is attributed to a reduction in the chemistry factor owing to an updated and revised copper content of forging AMX-77. The 72 EFPY adjusted reference temperatures are higher than the 54 EFPY adjusted reference temperatures at all locations for Oconee Unit 3 with the exception of the lower shell to transition forging weld and nozzle belt forging 4680. Reduction in adjusted reference temperature at 72 EFPY for nozzle belt forging 4680 is attributed to testing that was completed on a lower nozzle belt forging nozzle cutout thus significantly reducing the initial RT_{NDT} and margin term relative to what was reported for 54 EFPY. The 54 EFPY adjusted reference temperature reported for the lower shell to transition forging weld of <115°F conservatively includes consideration of the lower shell to transition forging weld, transition forging, and lower head.

As discussed in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898NP, Revision 0, it was confirmed that all three Oconee units will have sufficient operating windows to conduct heatups and cooldowns at 72 EFPY. In general, the ONS-1 and ONS-2, 72 EFPY pressure-temperature limits are slightly more restrictive than the 54 EFPY pressure-temperature limits over the entire reactor coolant system temperature range. For ONS-3, the 72 EFPY pressure-temperature limits are more restrictive than the 54 EFPY pressure-temperature limits between reactor coolant system temperatures of 60°F and approximately 170°F; above approximately 170°F the 54 EFPY pressure-temperature limits are more restrictive than the 72 EFPY pressure-temperature limits since the adjusted reference temperature for the controlling nozzle belt forging (4680) was lowered at 72 EFPY relative to 54 EFPY.

The peak inside surface fluence at the postulated inlet and outlet nozzle flaw location at 72 EFPY, considering all three Oconee units, is below 2.25E+17 n/cm^2, which is well below the screening criterion of 4.28E+17 n/cm^2 reported in PWROG-15109-NP-A [Reference 4.2-28]. However, the 72 EFPY pressure-temperature limits reported herein considered a shift in RT_{NDT} (ΔRT_{NDT}) for the reactor vessel outlet nozzle materials for all three units using RG 1.99 Revision 2 even though the projected shift in RT_{NDT} exceeded 25°F only for the ONS-3 outlet nozzles. The ONS-3 reactor vessel outlet nozzles were found to be limiting for a narrow temperature range (60°F to less than approximately 170°F) of the heatup and cooldown curves, and margin for ONS-3 may be regained by removing conservatisms in the 72 EFPY analysis (e.g., revision of heat transfer coefficients to be consistent with reactor coolant system flow during 1 and 2 pump operation at low reactor coolant system temperatures, reducing the heatup/cooldown rates at low reactor coolant system temperatures, and utilizing isothermal conditions to establish low temperature overpressure pressure-temperature limits) or utilizing provisions permitted by GL 88-11 [Reference 4.2-29], *"NRC Position on Radiation Embrittlement of Reactor Vessel Materials and its Impact on Plant Operations."*

> *"As plants age, it is expected that the operating window will continue to narrow and startup operations will become more difficult. [Regulatory Guide 1.99] Revision 2 accelerates this narrowing of the operating window. Licensees are encouraged to review system hardware and operating procedures to determine what changes could be made to reduce the likelihood of LTOP challenges. If changes can be implemented to demonstrate that the frequency of an LTOP event that would exceed [10 CFR 50] Appendix G limits is expected to be much less than one per reactor lifetime, then the staff would consider alternatives to Appendix G LTOP set points with appropriate justification of adequate safety from the standpoint of fracture prevention."*

<u>TLAA Disposition: 10 CFR 54.21(c)(1)(iii):</u>

Since the pressure-temperature limits will be updated through the 10 CFR 50.90 process at a later, more appropriate date, the effects of aging on the intended function(s) of the reactor vessels will be adequately managed for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii). The ONS *Reactor Vessel Material Surveillance* AMP (B2.1.9, GALL-SLR XI.M31), ONS *Neutron Fluence Monitoring* AMP (B3.2, GALL-SLR X.M2), and plant Technical Specifications will ensure that updated pressure-temperature limits based upon updated adjusted reference temperature values will be submitted to the NRC for approval prior to exceeding the period of applicability for Units 1, 2, and 3.

Table 4.2.4-1: Limiting Adjusted Reference Temperature Values for ONS-1 Reactor Vessel

Vessel Item	Wall Location	Limiting RT_{NDT} (^oF) at 54 EFPY	Limiting RT_{NDT} (^oF) at 72 EFPY
Beltline Base Metal/ Axial Weld	1/4T	171.0 (SA-1493)	188.1 (SA-1426/1430)
	3/4T	132.9 (C2197-2)	139.8 (C2197-2)
Beltline Circ. Weld	1/4T	164.2 (SA-1229)	182.6 (SA-1229)
	3/4T	132.1 (WF-25)	151.1 (WF-25)
Nozzle Belt (at 12-inch Wall Thickness)	1/4T	111.9 (AHR-54)	122.1 (AHR-54)
	3/4T	83.5 (AHR-54)	104.9 (AHR-54)
Outlet Nozzle (Postulated Corner Flaw	(1)	(2)	81.6
Lower Shell to Transition Forging Weld	1/4T	< 115 (3)	72.4 (WF-9)
	3/4T	< 115 (3)	69.6 (WF-9)

Note (1): Inside wetted surface

Note (2): No shift assumed; initial RT_{NDT} at 60°F per BAW-10046A, Revision 2, and Table 3-1. Fluence at 54 EFPY < 1.0E+17 n/cm^2 (E > 1.0 MeV)

Note (3): ANP-3127Q1NP-- Response to NRC Request for Additional Information Regarding License Amendment Request to Update Pressure-Temperature Limit Curves for Oconee Units 1, 2, and 3, (ADAMS Accession Number ML13259A120)

Table 4.2.4-2: Limiting Adjusted Reference Temperature Values for ONS-2 Reactor Vessel

Vessel Item	Wall Location	Limiting RT_{NDT} (°F) at 54 EFPY	Limiting RT_{NDT} (°F) at 72 EFPY
Beltline Base Metal/Axial Weld	1/4T	161.8 (AMX-77)	147.1 (AMX-77)
	3/4T	135.7 (AMX-77)	126.6 (AMX-77)
Beltline Circ. Weld	1/4T	193.1 (WF-25)	220.1 (WF-25)
	3/4T	132.5 (WF-25)	153.0 (WF-25)
Nozzle Belt (at 12-inch Wall Thickness)	1/4T	102.4 (AMX-77)	112.5 (AMX-77)
	3/4T	79.4 (AMX-77)	97.5 (AMX-77)
Outlet Nozzle (Postulated Corner Flaw)	(1)	(2)	81.0
Lower Shell to Transition Forging Weld	1/4T	< 115 (3)	77.2 (WF-112)
	3/4T	< 115 (3)	74.3 (WF-112)

Note (1): Inside wetted surface

Note (2): No shift assumed; initial RT_{NDT} at 60°F per BAW-10046A, Revision 2, Table 3-1. Fluence at 54 EFPY < 1.0E+17 n/cm^2 (E > 1.0 MeV)

Note (3): ANP-3127Q1NP-- Response to NRC Request for Additional Information Regarding License Amendment Request to Update Pressure-Temperature Limit Curves for Oconee Units 1, 2, and 3, (ADAMS Accession Number ML13259A120). Includes consideration of lower shell to transition forging weld, transition forging, and lower head

Table 4.2.4-3: Limiting Adjusted Reference Temperature Values for ONS-3 Reactor Vessel

Vessel Item	Wall Location	Limiting RT_{NDT} (°F) at 54 EFPY	Limiting RT_{NDT} (°F) at 72 EFPY
Beltline Base Metal/Axial Weld	1/4T	190.8 (4680)	164.1 (4680)
	3/4T	160.0 (4680)	129.4 (4680)
Beltline Circ. Weld	1/4T	195.6 (WF-67)	219.9 (WF-67)
	3/4T	162.1 (WF-70)	183.4 (WF-70)
Nozzle Belt (at 12-inch Wall Thickness)	1/4T	106.3 (4680)	106.0 (4680)
	3/4T	88.8 (4680	87.0 (4680)
Outlet Nozzle (Postulated Corner Flaw)	(1)	(2)	118.4
Lower Shell to Transition Forging Weld	1/4T	< 115 (3)	68.1 (WF-169-1)
	3/4T	< 115 (3)	65.8 (WF-169-1)

Note (1): Inside wetted surface

Note (2): No shift assumed; initial RTNDT at 60°F per BAW-10046A, Revision 2, Table 3-1. Fluence at 54 EFPY < 1.0 E+17 n/cm^2 (E > 1.0 MeV)

Note (3): ANP-3127Q1NP-- Response to NRC Request for Additional Information Regarding License Amendment Request to Update Pressure-Temperature Limit Curves for Oconee Units 1, 2, and 3, (ADAMS Accession Number ML13259A120). Includes consideration of lower shell to Transition forging weld, transition forging, and lower head.

4.2.5 LOW TEMPERATURE OVERPRESSURE PROTECTION

TLAA Description:

Low temperature overpressure protection systems at Oconee Units 1, 2, and 3 are required by Technical Specification Limited Condition for Operation 3.4.12 [Reference 4.2-30]. A pressurizer power operated relief valve provides the automatic relief capability during the design basis mass input and the design basis heat input transients to automatically prevent the reactor coolant system pressure from exceeding the pressure-temperature limit curves based on 10 CFR 50, Appendix G. Low temperature overpressure system setpoints and low temperature overpressure pressure-temperature limits are based on the pressure-temperature limit calculation which is a TLAA.

TLAA Evaluation:

The low temperature overpressure enable temperature has been determined for 72 EFPY in accordance with the requirements of ASME Section XI, Appendix G and is 269.2°F for ONS-1, and 307°F for Units 2 and 3, which are below the current Technical Specification requirement of 325°F. In MODE 3 with reactor coolant system cold leg temperatures less than 325°F, Technical Specification Limiting Condition of Operation 3.4.12 requires an operable power operated relief valve with a lift setpoint of < 535 psig for each unit. Calculation of a revised power operated relief valve setpoint and low temperature overpressure pressure-temperature limits will be performed at a later time and shall be consistent with ASME Section XI, Appendix G (2013 Edition or later), G-2215, as supplemented by consideration of applicable low temperature overpressure events and low temperature overpressure methodology as described in Duke Energy's license amendment requests for 33 EFPY pressure-temperature limits [Reference 4.2-31 and 4.2-32].

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

Since the low temperature overpressure enable temperature, power operated relief valve setpoint, and low temperature overpressure pressure-temperature limits will be updated through the 10 CFR 50.90 process at a later, appropriate date, the effects of aging on the intended function(s) of the ONS reactor vessels will be adequately managed for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii) The ONS *Reactor Vessel Material Surveillance* AMP (B2.1.19, GALL-SLR XI.M31) and plant Technical Specifications will ensure that updated low temperature overpressure enable temperature, power operated relief valve setpoint, and low temperature overpressure pressure-temperature limits, and pressure-temperature limits, based upon updated fluence and adjusted reference temperature values, will be submitted to the NRC for approval prior to exceeding the period of applicability for Units 1, 2, and 3.

4.2.6 REFERENCES

4.2-1 Duke Power Letter (Mike S. Tuckman) to NRC Document Control Desk, Application for Renewed Operating licenses, Oconee Nuclear Station, Unit Nos. 1, 2, and 3, July 6, 1998, ADAMS Accession Numbers ML15112A661 and ML15254A151

4.2-2 BAW-2251A, Demonstration of Management of Aging Effects for the Reactor Vessel, June 1996, ADAMS Accession Number ML20212G901

4.2-3 NUREG-1723, Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3, March 2000, ADAMS Accession Number ML003695154

4.2-4 Oconee Nuclear Station, Units 1, 2, And 3, Issuance of Amendments Regarding Revised Pressure-Temperature Limits, February 27, 2014, ADAMS Accession Number ML14041A093

4.2-5 Oconee Nuclear Station, Units 1, 2, And 3 License Amendment Request for Measurement Uncertainty Recapture Power uprate, February 19, 2020, ADAMS Accession Number ML20050D379

4.2-6 Regulatory Issue Summary 2014-11, Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components, October 14, 2014, ADAMS Accession Number ML14149A165

4.2-7 BAW-2241P/NP-A-00, Revision 2 Framatome, Fluence and Uncertainty Methodologies, April 2006, ADAMS Accession Numbers ML073310655(Proprietary) and ML073310660(Non-Proprietary)

4.2-8 Regulatory Guide 1.190, Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence, March 2001

4.2-9 BAW-2192, Revision 0, Supplement 1NP-A, Revision 0, Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels A & B Service Loads, December 2018, ADAMS Accession Number ML19101A344

4.2-10 BAW-2178, Revision 0, Supplement 1NP-A, Revision 0, Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels C & D Service Loads, December 2018, ADAMS Accession Number ML19101A345

4.2-11 10 CFR Part 50.60, Appendix G, Code of Federal Regulations, Title 10, Part 50 – Domestic Licensing of Production and Utilization Facilities, Appendix G – Fracture Toughness Requirements, Federal Register Vol. 84, Page 65644, November 29, 2019.

4.2-12 Regulatory Guide 1.99 Revision 2, Radiation Embrittlement of Reactor Vessel Materials, May 1988

4.2-13 BAW-2192, Revision 0, Supplement 1P-A, Revision 0, Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels A & B Service Loads, December 2018, ADAMS Accession Number ML19101A355

4.2-14 BAW-2178, Revision 0, Supplement 1P-A, Revision 0, Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels C & D Service Loads, December 2018, ADAMS Accession Number ML19101A355

4.2-15 Regulatory Guide 1.161, Evaluation Of Reactor Pressure Vessels With Charpy Upper-shelf Energy Less Than 50 Ft-lb, June 1995

4.2-16 NUREG/CR-5729, Multi-variable Modeling of Pressure Vessel and Piping J-R Data

4.2-17 PWROG-17090-NP-A, Revision 0, Generic Rotterdam Forging and Weld Initial Upper-Shelf Energy Determination, January 2020, ADAMS Accession Number ML20024E238

4.2-18 ANP-3898P, Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA, May 2021

4.2-19 10 CFR Part 50.61, Fracture toughness requirements for protection against pressurized thermal shock events

4.2-20 ANP-3898NP, Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA, May 2021

4.2-21 SECY-82-465, Pressurized Thermal Shock (PTS), Enclosure A, November 23, 1982, ADAMS Accession Number ML16232A574

4.2-22 Not Used.

4.2-23 BAW-10046A, Revision 2, Methods of Compliance with Fracture Toughness and Operational Requirements of 10 CFR 50, Appendix G, June 1986, ADAMS Accession Number ML20207G642

4.2-24 Not Used

4.2-25 Not Used

4.2-26 NUREG-2192, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants.” July 2017.

4.2-27 Not Used.

4.2-28 PWROG-15109-NP-A, Revision 0, PWR Pressure Vessel Nozzle Appendix G Evaluation, January 2020, ADAMS Accession Number ML20024E573

4.2-29 NRC Generic Letter 88-11, NRC Position on Radiation Embrittlement of Reactor Vessel Materials and its Impact on Plant Operations, July 12, 1988

4.2-30 Oconee Nuclear Station Technical Specification Limited Condition for Operation 3.4.12

4.2-31 Oconee Nuclear Station, Units 1, 2 & 3, License Amendment Request to Revise Pressure-Temperature Limits of Technical Specifications 3.4.3 Heatup, Cooldown and Inservice Test Limitations, May 11, 1999, ADAMS Accession Number ML15261A471

4.2-32 Oconee Nuclear Station, Units 1, 2 & 3, License Amendment Request to Update Pressure-Temperature Limit Curves, February 22, 2013, ADAMS Accession Number ML13058A059

4.2-33 Oconee Nuclear Station, Units 1, 2 & 3 NRC issuance of Amendment Numbers 420, 422 and 421 Measurement Uncertainty Recapture Power Uprate, January 26, 2021, ADAMS Accession Number ML20335A001

4.2-34 Oconee Nuclear Station, Units 1, 2, And 3, Issuance of Amendments to Update Pressure-Temperature Limit Curves NRC SER, ADAMS Accession Number ML14041A093

4.3 METAL FATIGUE

Fatigue analyses are required on components designed to ASME, Section III, Class 1 and USAS (ANSI) B31.7. In addition, certain other codes such as ASME Section III, Class 2 and 3, USAS (ANSI) B31.1, and ASME Section VIII Division 2, may require a fatigue analysis or assume a stated number of full-range thermal and displacement transient cycles. NUREG-2192 also provides examples of components that are likely to have fatigue TLAAs within the CLB that would require evaluation for the SPEO. Searches were performed to identify these and any other potential fatigue TLAAs within the CLB for Oconee Units 1, 2 and 3. Each of the potential TLAAs were evaluated against the six TLAA screening criteria specified in 10 CFR 54.3. The TLAA evaluated were determined to meet the criteria of 10 CFR 54.21 and are within the scope of SLR. Those that were identified as fatigue TLAAs are evaluated using 80-year transient cycle and cumulative usage projections, described is Section 4.3.1, and summarized in the following subsections:

- Transient Cycle Projections for 80 Years (Section 4.3.1)
- Class 1 Fatigue Analyses (including fatigue waivers) (Section 4.3.2)
- Non-Class 1 Fatigue Analyses (Section 4.3.3)
- Environmentally-Assisted Fatigue (Section 4.3.4)
- Analytical Evaluation of Flaws (Section 4.3.5)
- Weld Overlay Fatigue Analyses (Section 4.3.6)

4.3.1 TRANSIENT CYCLE PROJECTIONS FOR 80 YEARS

Transient cycle projections for 80 years are not themselves time-limited aging analysis for Oconee. Transient cycle projections do form what is considered to be the time-limited aspect of various fatigue analysis. Fatigue analyses are based upon numbers and amplitudes of thermal and pressure transients. UFSAR Tables 5-2, “Transient Cycles for RCS Components Except Pressurizer Surge Line” and UFSAR Table 5-23, “Operating Design Transient Cycles for Pressurizer Surge Line” [Reference 4.3-1] list the design transients and associated design cycles. The intent of the design basis transient definitions is to bound a wide range of possible events with the varying ranges of severity in temperature and pressure. CLB fatigue analyses are based upon the original number of design cycles (40 years) and are postulated to bound 60 years of service. Since the fatigue analyses are based upon the number of cycles postulated to bound 60 years of service, these fatigue analyses are considered TLAAs and require disposition for the SPEO.

A review of *Fatigue Monitoring* program data was performed to identify the number of cumulative cycles for each transient type that occurred at Units 1, 2, and 3 up to May 6, 2019. Baseline cycle counts were projected to an 80-year operating life based on the actual accumulation history since December 2011 (December 2011 through May 6, 2019). They do not represent a revision of the design basis. These transient cycles and projections are documented in Table 4.3.1-1, *“80-year*

Transient Cycle Projections." As shown in industry operating experience for most nuclear power plants, accumulation of transients have decreased over time. Therefore, transient projections based on operating experience provide an appropriate basis for future projections. Each monitored design transient was evaluated to determine the maximum rate of accumulation of the individual transients per unit. The maximum rate of accumulation was used to extrapolate the projected number of future occurrences beginning May 6, 2019 and ending at 60 years of operation. The 60-year projections are scaled by the maximum rate of accumulation determined for each of the design transients for twenty additional years of operation (80 years). The end of 80-year life is February 2053 for Unit 1, October 2053 for Unit 2, and July 2054 for Unit 3.

Three components at Oconee have a reduced set of analyzed operating cycles for 60 years of operation that will remain valid for 80 years of operation. These components are the pressurizer surge line elbow, the main steam penetrations, and the main feedwater penetrations. The pressurizer surge line elbow is addressed in Section 4.3.4 of the application. The main steam and main feedwater penetrations are addressed in Section 4.6.3 of the application. As part of subsequent license renewal these components were re-analyzed and the 80-year projections are bounded by the refined allowable transient cycles for these components. The *Fatigue Monitoring* aging management program will track the governing transients for these penetrations, using the refined, current operating period cycle count and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

As shown in Table 4.3.1-1, the projected cycles for 80 years of plant operation are less than the 40-year design cycles, or CLB cycles, used in the fatigue analyses. Therefore, the design cycles originally projected for 40-year operation bound the 80-year projected operating cycles. The basis for assessing and projecting design transient cycles to the end of the subsequent period of operation is not a TLAA because the basis does not involve assessment of an applicable aging effect and does not meet criterion 2 for defining TLAAs in 10 CFR 54.3(a). The evaluation of fatigue is a TLAA for those major components and piping exposed to reactor coolant in the reactor coolant system pressure boundary, including the reactor vessel and the reactor vessel internals, as well as fatigue related to the containment pressure boundary.

Two major plant changes have occurred since initial license renewal - reactor vessel closure head replacements and once-through steam generator replacements:

- The design of the reactor vessel closure head replacements, installed in 2003 and 2004, were based upon the projected 60-year design cycles which are bounded by the 40-year design cycles.
- The design of the replacement once-through steam generators, also installed in 2003 and 2004, were based upon the projected 60-year design cycles which are bounded by the 40-year design cycles.

For each instance described in the following sections where the values in Table 4.3.1-1 are used in the disposition of the TLAA, in order to ensure the design cycles remain bounding in the component fatigue analyses, the *Fatigue Monitoring* AMP will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits. A condition report will be initiated based upon an administrative limit of 80% of the fatigue cycles or if the minimum time for any transient event total occurrence projection to reach the allowable is less than three years.

Table 4.3.1-1: 80-Year Transient Cycle Projections

Transient Description	Observed Transient Cycles (5/6/19)			Projected Cycles for 80 years	Percent of Design Cycles	CLB cycles (40 year design cycles)
	Unit 1	Unit 2	Unit 3			
Heatup (1A)	124	125	100	189	52.8	360(1)
Cooldown (1B)	125	131	98	197	54.8	360(1)
Stratification Reactor Coolant Pump > 120 (1AP4)	31	25	24	88	39.9	220
Stratification Reactor Coolant Pump < 120 (1AP5)	4	5	5	11	25	43
Stratification Hot Leg: Pressurizer dT > 250F (1BP1)	24	14	15	70	41.2	170
Stratification Hot Leg: Pressurizer dT < 250F (1BP2)	10	16	14	34	18	190
0 – 15% Power (2A)	234	194	178	335	23.2	1440
15 – 0% Power (2B)	149	113	109	220	15.3	1440
Step Up (7A) (Turbine Trip)	6	5	2	8	5	160
Step Down (7B) (Load Rejection)	21	18	10	27	18	150

Table 4.3.1-1: 80-Year Transient Cycle Projections

Transient Description	Observed Transient Cycles (5/6/19)			Projected Cycles for 80 years	Percent of Design Cycles	CLB cycles (40 year design cycles)
	Unit 1	Unit 2	Unit 3			
Reactor Trip with Loss Reactor Coolant Flow (8A)	4	1	0	7	17	40(1)
Reactor Trip with Turbine Trip, no runback (8B)	28	17	15	48	29.7	160(1)
Reactor Trip w/ Loss of Main FW Flow (8C)	29	19	13	47	52	90(1)
Other Reactor Trips (8D)	61	49	59	102	83.5	122(1)
Manual High Pressure Injection Actuation (8E)	20	19	12	29	26.5	70
Rapid De-pressurization (9)	0	0	2	27	67	40(1)
Reactor Coolant Flow Changes, Loss Reactor Coolant Pumps (10)	11	3	5	12	3	412
Rod Withdrawal (11)	0	0	0	0	0	40
Rod Drop (14)	16	19	10	28	46.5	60
Loss of Power (15)	1	2	1	3	7	40

Table 4.3.1-1: 80-Year Transient Cycle Projections

Transient Description	Observed Transient Cycles (5/6/19)			Projected Cycles for 80 years	Percent of Design Cycles	CLB cycles (40 year design cycles)
	Unit 1	Unit 2	Unit 3			
Steam Line Failure (16)	0	0	0	0	0	1
Loss of Feedwater to one A Once Through Steam Generators (17A)	12	3	3	16	52	30
Loss of Feedwater to one B Once Through Steam Generators (17B)	0	0	1	1	13	10
Loss of Coolant (Faulted) (21)	0	0	0	0	0	1
High Pressure Injection System Test (performed <200F) (22A)	4	2	8	11	27	40

Note 1: These transients have a reduced set of analyzed transient cycles for 60 years for the pressurizer surge line, main steam penetrations and main feedwater penetrations. The pressurizer surge line elbow is addressed in Section 4.3.4 and the main steam and main feedwater penetrations are addressed in Section 4.6.3.

4.3.2 CLASS 1 COMPONENT FATIGUE EVALUATIONS

Class 1 fatigue analyses were originally performed in accordance with the ASME Code, Section III for reactor coolant system vessels supplied by B&W, USAS B31.7, Class I for B&W supplied piping, and USAS B31.7, Class II for Bechtel supplied piping in ancillary systems attached to B&W supplied components and extending to the first outboard isolation valve. In accordance with the ONS UFSAR, Section 3.2.2.2, reactor coolant system Class 1 piping (USAS B31.7 Class I and II) was redesigned to the 1983 ASME Section III Code during the steam generator replacement project. The reactor coolant pump casings were designed, fabricated, inspected and tested to meet the intent of the ASME Boiler and Pressure Vessel Code, Section III, for Class A vessels, but are not code stamped. The specific ONS reactor coolant system component design codes are reported in the Oconee UFSAR, Table 5-4. Each Class 1 fatigue analysis must demonstrate that the CUF for the component will not exceed the code design limit of 1.0 when the component is exposed to all postulated normal and upset design transients.

During the initial license renewal period, several changes occurred that potentially impact the TLAA evaluation for the reactor coolant system Class 1 components. These changes are listed here and discussed within the appropriate sections that follow:

- Reactor vessel closure head replacement in 2003-2004 (Units 1, 2, and 3)
- Steam generator replacement 2003-2004 (Units 1, 2, and 3)
- Alloy 600 primary water stress corrosion cracking mitigation including nozzle repair and/or full structural weld overlay for pressurizer nozzles, pressurizer spray, and pressurizer safety/relief nozzles, both surge line nozzles, and the reactor coolant system branch attached piping.
- Measurement uncertainty recapture (ONS 1, 2, and 3) [References 4.3-3 and 4.3-26].

The following subsections characterize the fatigue TLAA evaluation results for the safety class 1 components:

- Reactor vessel (Section 4.3.2.1)
- Reactor vessel internals (Section 4.3.2.2)
- Once through steam generators (Section 4.3.2.3)
- Reactor coolant pumps (Section 4.3.2.4)
- Pressurizer (Section 4.3.2.5)
- Control rod drive mechanism housing (Section 4.3.2.6)

- Reactor coolant system piping and connected lines (Section 4.3.2.7)
- Pressurizer surge line (Section 4.3.2.8)

In addition, a detailed fatigue evaluation is not required if components conform to the waiver of fatigue requirements per ASME Code, Section III. These fatigue waivers depend on the numbers of anticipated transients over the life of the plant and therefore constitute TLAAs. Fatigue waivers are discussed separately in Section 4.3.2.9.

4.3.2.1 Reactor Vessel

TLAA Description:

Reactor vessel fatigue evaluations were performed to the requirements of ASME Code, Section III, Class A, 1965 Edition through Summer 1967 Addenda (Oconee Units 1, 2, and 3) for the vessel shell and lower head for all three Oconee units. The original reactor vessel closure heads were replaced at all three Oconee units utilizing the ASME Code, Section III, 1989 Edition with no addenda [Reference 4.3-11]. Fatigue analyses that consider transient cycles that occur over the life of the plant constitute TLAA that must be evaluated for subsequent license renewal.

TLAA Evaluation:

The transient cycles for the reactor vessel were projected for 80 years of operation as discussed in Section 4.3.1 and the count found to be adequate for the SPEO. As reported in Table 4.3.1-1, the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. The *Fatigue Monitoring* AMP (B3.1) will continue to monitor all design transients. The program will assure that appropriate actions are taken to ensure that the design CUF values remain less than unity during the SPEO.

During the initial LR period, several changes occurred that potentially impact the TLAA evaluation for the reactor coolant system class 1 components. The reactor vessel was involved in two of these changes. The first change was the reactor vessel closure head replacement in 2003 and 2004. The replacement closure heads were designed and fabricated by B&W Canada. The sizing calculations and the stress and fatigue analysis were performed to ASME Code, Section III, Class 1, 1989 Edition with no Addenda. These analyses utilize the original 40-year design transient cycles to calculate a fatigue CUF. A second change is the ongoing pursuit of a measurement uncertainty recapture power uprate. The revised operating conditions associated with the uprate were reviewed for impacts to the existing design basis analyses for the reactor vessel, specifically the reactor vessel shells, lower head and replacement closure heads [Reference 4.3-3]. No impacts were found. No changes in the reactor coolant system functional design or operating pressures are included in the design of the uprate. The effects of operating temperature changes (T_{hot}/T_{cold}) are within design limits. The measurement uncertainty recapture power uprate conditions are bounded by the design conditions. The *Fatigue Monitoring* program (B3.1) will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The effects of fatigue on the intended functions of the reactor vessels will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) for the SPEO.

4.3.2.2 Reactor Vessel Internals

TLAA Description:

As described in BAW-2248A [Reference 4.3-4], Sections 2.0 and 4.5.1, the reactor vessel internals were designed and constructed prior to the development of ASME Code requirements for core support structures. Because of the lack of specific ASME design rules for core support structures at the time of design and construction of the Oconee reactor vessel internals, Section III of the ASME code was used as a guideline for the design criteria for the reactor vessel internals. Qualification of the internals was accomplished by both analytical and test methods. The only specific fatigue analyses performed in the original design were those that addressed flow-induced vibration reported in BAW-10051, Revision 1 [Reference 4.3-7], Section 4.7.1.2, *Reactor Vessel Internals Flow Induced Vibration Endurance Limits*, herein, addresses this Oconee reactor internals TLAA issue.

After operations began, Inservice Inspection (ISI) at the three Oconee nuclear plants during 1981 and 1982 revealed failed bolts in the joint fastening the lower end of the reactor vessel thermal shield to the lower grid assembly. These bolts were made of A-286 material. The failed bolts were replaced with X-750 bolting and fatigue analyses were performed for the replacement bolts as reported in BAW-1843PA [Reference 4.3-5]. This topical report summarize fatigue analyses performed to the ASME code (Section III, Subsection NG) including both high cycle fatigue (flow-induced vibration) and low cycle fatigue (design transients). The ASME Section III fatigue evaluations for internal replacement bolting were evaluated in BAW-2248A [Reference 4.3-4] for 60-years and are addressed here for SLR. The low cycle fatigue (design transients) of the replacement bolting is the only reactor internals component discussed in this section.

TLAA Evaluation:

The transient cycles for the reactor internals replacement bolting were projected for 80 years of operation as discussed in Section 4.3.1 and the count found to be adequate for the SPEO. As reported in Table 4.3.1-1, the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. The *Fatigue Monitoring* AMP (B3.1) will continue to monitor all design transients. The program will assure that appropriate actions are taken to ensure that the design CUF values remain less than unity during the SPEO.

The contribution of flow-induced vibration to the total CUF for replacement bolting, as first reported in BAW-1843PA, was extended to 80-years consistent with the methodology used for the 60-year evaluation using Crandall’s method, and is reported in Proprietary Report ANP-3899P, Revision 0 and in Non-Proprietary Report ANP-3899NP, Revision 0 [References 4.3-6 and 4.3-7 respectively]. With consideration of contributions from thermal fatigue and flow-induced vibration the total CUF of reactor vessel internals replacement bolting remains less than unity during the SPEO.

Therefore, the fatigue analyses for the reactor internals replacement bolting are projected to have adequate margin in order to remain valid for the SPEO. In order to ensure the design cycles remain bounding for the reactor internals replacement bolting, the *Fatigue Monitoring* AMP (B3.1) will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The effects of fatigue on the intended functions of the reactor vessel internals bolting have been projected to the end of the SPEO and adequate margin exists. The *Fatigue Monitoring* AMP (B3.1) will continue to monitor reactor coolant system design transients for the SPEO. Therefore, This TLAA is dispositioned in accordance with 10 CFR 54.21(c)(iii).

4.3.2.3 Once Through Steam Generators

TLAA Description:

The original steam generators at Oconee have been replaced with new steam generators. The original Unit 1 steam generators were replaced in 2003 during the 1EOC21 refueling outage. Units 2 and 3 original steam generators were replaced in 2004 during the 2EOC20 and 3EOC21 refueling outages. The replacement once though steam generators were fabricated by BWC, Limited. The materials used in the construction of the replacement once though steam generators were equivalent or superior to the original once though steam generators design with regard to fabricability, thermal expansion differentials, and corrosion resistance. The replacement steam generators are designed and fabricated in accordance with the 1989 edition, no addenda of the ASME Boiler and Pressure Vessel Code Section III [Reference 4.3-11]. The fatigue evaluations of the steam generators were performed to the requirements of ASME Code, Section III. These analyses utilize the 40-year design transient cycles to obtain usage factors.

TLAA Evaluation:

The transient cycles for the replacement once though steam generators were projected for 80 years of operation as discussed in Section 4.3.1 and the count found to be adequate for the SPEO. As reported in Table 4.3.1-1, the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. Therefore, the fatigue analyses for the steam generator components are projected to have adequate margin in order to remain valid for the SPEO. In order to ensure the design cycles remain bounding in the steam generator component fatigue analyses, the *Fatigue Monitoring* AMP (B3.1) will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The effects of fatigue on the intended functions of the steam generator components will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) for the SPEO. Therefore, this TLAA is dispositioned in with 10 CFR 54.21(c)(1)(iii).

4.3.2.4 Reactor Coolant Pumps

TLAA Description:

The reactor coolant pumps for Unit 1 are Westinghouse Type 93A and Units 2 and 3 are Bingham-Willamette Pumps. The reactor coolant pump casings were designed to ASME Code, Section III, Class A, 1965 Edition, 1967 Addendum, but are not Code stamped [Reference 4.3-11]. Fatigue evaluations of the reactor coolant pumps were performed to various editions of the ASME Code, Section III.

TLAA Evaluation:

The transient cycles for the reactor coolant pumps were projected for 80 years of operation as discussed in Section 4.3.1 and the count found to be adequate for the SPEO. As reported in Table 4.3.1-1, the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. Therefore, the fatigue analyses for the reactor coolant pumps are projected to have adequate margin in order to remain valid for the SPEO. In order to ensure the design cycles remain bounding in the reactor coolant pump fatigue analyses, the *Fatigue Monitoring* AMP (B3.1) will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The effects of fatigue on the intended functions of the reactor coolant pump components will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.2.5 Pressurizer

TLAA Description:

Units 1, 2, and 3 each have a 1,500 ft^3 cylindrical pressurizer. The fatigue evaluations of the pressurizer were performed to the requirements of ASME Code, Section III, Class A, Summer 67 Addendum [Reference 4.3-11]. The fatigue analyses associated with the pressurizer utilize 40-year design cycles as inputs to obtain usage factors.

Additionally, at the time of steam generator replacement, code reconciliation and reanalysis to ASME Section III, Subsection NB, 1983, no addenda was performed for the pressurizer relief valve nozzles.

TLAA Evaluation:

The transient cycles for the pressurizer components were projected for 80 years of operation as discussed in Section 4.3.1 and the count found to be adequate for the SPEO. As reported in Table 4.3.1-1, the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. Therefore, the fatigue analyses for the pressurizer components are projected to have adequate margin in order to remain valid for the SPEO. In order to ensure the design cycles remain bounding in the pressurizer component fatigue analyses, the *Fatigue Monitoring* AMP (B3.1) will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The effects of fatigue on the intended functions of the pressurizer components will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.2.6 Control Rod Drive Mechanism Housing

TLAA Description:

The control rod drive mechanisms at all three Oconee units were replaced with Type C drives with the reactor vessel closure head replacements. The design of the control rod drive mechanism pressure boundary has been shown to satisfy all of the applicable design criteria for the replacement control drive mechanisms and the requirements of the ASME Boiler and Pressure Vessel Code, 1968 Edition with Addenda through the Summer of 1970 for all of the pressure boundary items except for the “Quick Vent” and “Hydraulic Closure.” The “Quick Vent” meets the requirements of its design code; the ASME Boiler and Pressure Vessel Code, Section III, 1974 with no Addenda. The “Hydraulic Closure” meets the requirements of its design code; the ASME Boiler and Pressure Vessel Code, Section III, 1980 with Addenda through Summer of 1982.

The replacement control rod drive mechanisms were spare control rod drive mechanisms in Framatome’s inventory that were available from plants that were not completed. These replacement control rod drive mechanisms were structurally assessed against the original design reports and were shown to be acceptable for fatigue by meeting exemption from fatigue analysis requirements per paragraph N-415.1 of the ASME Code Section III – 1968 edition with Summer 1970 Addenda. Exemption from fatigue analyses that consider design transient cycles that occur over the life of the plant constitute TLAA that must be evaluated for SLR.

TLAA Evaluation:

The transient cycles for the control rod drive mechanism housings were projected for 80 years of operation as discussed in Section 4.3.1 and the count found to be adequate for the SPEO. As reported in Table 4.3.1-1, the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. Therefore, the exemption from fatigue analyses for the control rod drive mechanism housings are projected to have adequate margin in order to remain valid for the SPEO. In order to ensure the design cycles remain bounding in the control rod drive mechanism housing fatigue analyses, the *Fatigue Monitoring* AMP (B3.1) will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

<u>TLAA Disposition: 10 CFR 54.21(c)(1)(iii):</u>

The effects of fatigue on the intended function(s) of the ONS Type C control rod drive mechanisms will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.2.7 Reactor Coolant System Piping and Connected Lines

<u>TLAA Description:</u>

The design cycles originally projected for a 40 year operating life for the reactor coolant system piping and connected lines is the focus of this TLAA. Reactor coolant system piping, excluding the pressurizer surge line and spray line, was originally designed to USAS (ANSI) B31.7, 1968 with Errata through June 1968. The pressurizer surge line was originally analyzed to ASME Code, Section III, 1977 Edition through Summer 1979 Addenda and then reanalyzed to ASME Section III, 1986 Edition in response to NRC Bulletin 88-11 [Reference 4.3-8]. The pressurizer surge line is addressed in Section 4.3.2.8. The original pressurizer spray line was redesigned and evaluated to ASME Section III, 1986 Edition. The redesign eliminated the welded attachments on the piping by relocating some of the pipe supports. A new bypass valve and isolation valve were also added as well as replacement of the auxiliary spray to main spray tee, which was a high fatigue location. The replacement of the steam generators necessitated the reanalysis of the main reactor coolant piping. For the reactor coolant system piping, a design code change was reconciled and the main reactor coolant system piping analysis was updated to ASME Section III, Subsection NB, 1983, no addenda from ANSI B31.7, Class 1, 1968 with Errata through June 1968.

Additionally at the time of steam generator replacement, code reconciliation and reanalysis to ASME Section III, Subsection NB, 1983, no addenda was done for the following reactor coolant system piping branch lines that were reanalyzed up to the first isolation valve from the main reactor coolant system piping.

1. High Pressure Injection (Emergency Injection)
2. High Pressure Injection (Normal Injection)
3. High Pressure Injection (Letdown)
4. Low Pressure Injection (Decay Heat Removal Drop-line)
5. Low Pressure Injection (Core Flood)
6. Reactor Coolant Drains

<u>TLAA Evaluation:</u>

The transient cycles for the reanalyzed reactor coolant system piping components, including various branch lines, were projected for 80 years of operation as discussed in Section 4.3.1 and the count found to be adequate for the SPEO. As reported in Table 4.3.1-1, the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. Therefore, the fatigue analyses for the reactor coolant system piping components, including various branch lines, are projected to have adequate margin in order to remain valid for the SPEO. In order to ensure the design cycles remain bounding in the reactor coolant system piping components and connected lines pressurizer component fatigue analyses, the *Fatigue Monitoring* AMP (B3.1) will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The effects of fatigue on the intended functions of the reactor coolant system piping and connected lines will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.2.8 Pressurizer Surge Line

TLAA Description:

Specific industry issues associated with fatigue due to thermal stratification were identified for the pressurizer surge line in NRC Bulletin 88-11 [Reference 4.3-8], *Pressurizer Surge Line Thermal Stratification.* Original design analyses of the surge line did not include stratified flow loading conditions. An assessment of stratification effects on the pressurizer surge line was necessary to ensure piping integrity and code compliance. NRC Bulletin 88-11, issued in December 1988, requested utilities to establish and implement a program to confirm the integrity of the pressurizer surge line. The program required both visual inspection of the surge line and demonstration that the design requirements of the surge line are satisfied, including the consideration of stratification effects. The demonstration was an ASME Code, Section III fatigue analysis to account for thermal stratification. The analysis uses time-limited assumptions such as thermal and pressure transients and operating cycles for the licensed life of the plant. In addition to the focus on this piping related to the Bulletin, the surge line is also identified as a fatigue sentinel location for environmentally assisted fatigue which is discussed in SLR-ONS-TLAA-0306P/NP, Revision 0 (Enclosure 5, Attachment 3 for the Proprietary version and Enclosure 4, Attachment 3 for the Non-Proprietary version).

TLAA Evaluation:

The transient cycles for the reanalyzed pressurizer surge line were projected for 80 years of operation as discussed in Section 4.3.1 and the count found to be adequate for the SPEO. As reported in Table 4.3.1-1, the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. Therefore, the fatigue analyses for the pressurizer surge line is projected to have adequate margin in order to remain valid for the SPEO. In order to ensure the design cycles remain bounding in the pressurizer surge line fatigue analyses, the *Fatigue Monitoring* AMP (B3.1) will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The effects of fatigue on the intended function(s) of the pressurizer surge line as established as a result of reanalysis for I E Bulletin 88-11 will be adequately managed by the *Fatigue Monitoring* aging management program (B3.1) for the subsequent period of extended operation. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.2.9 Class 1 Component Fatigue Waiver Evaluations

TLAA Description:

The 1983 ASME Section III, Subsection NB-3630 allows for Class 1 piping to be exempt from Class 1 analysis requirements if the piping meets all the conditions specified in subparagraph NB-3630(d)(2)(a) through (e) [Reference 4.3-11]. A detailed fatigue evaluation is not required if components conform to specific waiver of fatigue requirements. The 40-year design cycles are utilized to classify piping to be exempt from Class 1 analysis. ASME Code Section III, Class 1 component fatigue waivers are discussed in this section.

The following reactor coolant system piping components, reanalyzed to ASME Section III as discussed in Section 4.3.2.7, contain fatigue waivers.

1. Oconee Units 1, 2 and 3 pressurizer spray nozzles
2. Oconee Units 1, 2 and 3 letdown lines
3. Oconee Units 1, 2 and 3 decay heat line
4. Oconee Units 1, 2 and 3 loop drain piping and nozzles
5. Portion of Oconee Units 1, 2 and 3 core flood piping

In addition to these components, preemptive repairs were designed for the hot leg and cold leg resistance temperature detector thermowells and pressure tap and flow meter nozzles to eliminate Alloy 600 and Alloy 82/182 materials, which are susceptible to primary water stress corrosion cracking. The following additional component designs involved in these preemptive repairs contain fatigue waivers that are conservatively based on the total number of design cycles even though the first repairs were implemented in 2015, which is after all three Oconee units had been in operation for 40 years.

1. Oconee Units 1 and 2 reactor coolant system small bore nozzle component replacements
2. Oconee Units 1, 2 and 3 reactor coolant system abandoned thermowell mitigation

The 1983 ASME Code, under sub article NB-3630, Section III, Division 1 allows for Class 1 piping to be exempt from Class 1 analysis requirements if the piping meets all the conditions specified in subparagraph NB-3630(d)(2)(a) through (e).

TLAA Evaluation:

The transient cycles utilized in the fatigue waivers were projected for 80 years of operation as discussed in Section 4.3.1 and the count found to be adequate for the SPEO. As reported in Table 4.3.1-1, the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. Therefore, the fatigue waivers are projected to remain valid for the SPEO. In order to ensure the design cycles remain bounding for the fatigue waivers, the *Fatigue Monitoring* AMP (B3.1) will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The ASME Code, Section III Class 1 component fatigue waivers will be managed by the *Fatigue Monitoring* AMP (B3.1) through the SPEO. The *Fatigue Monitoring* program will monitor the transient cycles in Table 4.3.1-1 which are the inputs to the fatigue waiver analyses and require action prior to exceeding design limits that would invalidate the fatigue waivers. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.3 NON-CLASS 1 PIPING FATIGUE ANALYSES

TLAA Description:

For all the Oconee non-class 1 mechanical systems within the scope of SLR, only the piping components have been explicitly designed to consider thermal transient cycle count assumptions that must be revalidated for the extended period of operation. These piping systems are designed to ANSI B31.7 Class II and Class III and ANSI B31.1 requirements. Piping systems designed to these codes are not required to have an explicit analysis of cumulative fatigue usage, but rather cyclic loading is considered in a simplified manner in the design process. A stress range reduction factor is required to be used based on the number of expected thermal cycles during the period of plant operation. If the total number of expected thermal cycles for a piping system is less than 7,000, then a stress range reduction factor of 1.0 is applied. If the total number of expected thermal cycles for a piping system is greater than 7,000, a stress range reduction factor less than 1.0 is applied to reduce the alternating stress range to demonstrate the likelihood of piping failure is low. The stress range reduction factors for piping design requirements are shown in Table 4.3.3-1. The evaluation for required stress range reduction factors performed as part of the piping design are implicit fatigue analyses since they are based upon the number of fatigue cycles expected for the life of the piping, therefore they are TLAAs that require evaluation for subsequent license renewal. In addition, there are no components within the systems managed by this TLAA, that are designed in accordance with ASME Code, Section VIII, Division 2 requirements.

Table 4.3.3-1: Stress Range Reduction Factors for Piping Designed per ANSI B31.1

Number of Equivalent Full Temperature Cycles	Stress Range Reduction Factor
7,000 and less	1.0
7,000 - 14,000	0.9
14,000 - 22,000	0.8
22,000 - 45,000	0.7
45,000 - 100,000	0.6
100,000 and over	0.5

TLAA Evaluation:

Non-class 1 piping systems are often subject to continuous steady state operation such that operating temperatures only vary during operational transients. Included in these transients are reactor trips, heatups, cooldowns, and system actuations. Each of these transients can affect systems differently (for example, a reactor trip could cause a thermal transient for high pressure turbine exhaust, low pressure turbine extraction, condensate and feedwater, but not main steam lines); therefore, it is important to separate these events out as described below.

Data from the life of the plant, along with system knowledge, was used to project the various types of plant transients that could cause a thermal cycle in any portion of non-class 1 mechanical piping systems. Conservatism was built into these projections to further demonstrate the adequacy of the current stress range reduction factors that are applied to the piping systems. The estimated 80-year thermal cycles for in scope systems were found to be less than 7,000 cycles in all locations, expect for one portion of the chemical addition system. The pressurizer sample line is expected to experience 29,200 cycles due to daily sampling. This location was identified during initial license renewal, and a stress range reduction factor of 0.7 has been applied to this section of piping to allow for a total of 45,000 thermal cycles to occur.

Portions of the following piping systems are in scope for subsequent license renewal, were designed in accordance with ANSI B31.7 or ANSI B31.1 requirements, and are operated in a manner that subjects the piping to thermal cycles: auxiliary steam, chemical addition, component cooling water, condensate, condenser circulating water, coolant storage, feedwater, gaseous waste disposal, heater drain, heater vent, high pressure injection, high pressure turbine exhaust, instrument air, low pressure injection, low pressure service water, low pressure turbine extraction, main steam, plant heating, reactor coolant, standby shutdown facility air intake and exhaust, standby shutdown facility diesel lube oil, steam drain, steam seal, and vacuum.

Table 4.3.3-2 provides a summary description of which systems will experience thermal cycles during various modes of operation, along with the 80-year projected number of cycles that will occur. There are no portions of non-class 1 piping in scope for SLR that exceed the allowable number of thermal cycles; therefore, the stress range reduction factors applied to the piping systems remain valid in all locations.

Table 4.3.3-2: 80-Year Thermal Cycle Projections for Non-Class 1 Piping Designed to ANSI B31.1 Code Requirements

Piping System	Description of System Locations	Conservative Assumption of Cycles	Projected Cycles for 80 Years
Auxiliary Steam	Swapping steam source between units	Monthly	<1,000
	Steam to feedwater pump turbines	2 per heatup, 1 per reactor trip	<1,000
	Steam to plant drinking water heater	1 per cooldown, 1 per heatup	<1,000
	Steam to various loads associated with power operation	1 per cooldown, 1 per heatup	<1,000
Chemical Addition	Pressurizer sample line[(1)]	Daily	<30,000
	Steam generator sample line	1 per cooldown, 1 per heatup	<1,000
	Moisture separator reheater and feedwater sample lines	1 per cooldown, 1 per heatup, 1 per reactor trip	<1,000
Component Cooling	Reactor coolant letdown cooler	1 per cooldown, 1 per heatup	<1,000

Table 4.3.3-2: 80-Year Thermal Cycle Projections for Non-Class 1 Piping Designed to ANSI B31.1 Code Requirements

Piping System	Description of System Locations	Conservative Assumption of Cycles	Projected Cycles for 80 Years
Condensate	Hotwell to feedwater pumps	1 per cooldown, 1 per heatup	<1,000
	Recirculation cleanup lines	1 per cooldown, 1 per heatup	<1,000
Condenser Circulating Water	Service water discharge from residual heat removal coolers	1 per cooldown, 2 per heatup	<1,500
Coolant Storage	Steam generator and pressurizer vent lines to the quench tank	1 per cooldown, 1 per heatup	<1,000
Feedwater	Feedwater pumps to steam generators	1 per reactor trip, 1 per heatup, 1 per cooldown	<1,000
	Feedwater pump minimum recirculation lines	2 per cooldown, 2 per heatup, 1 per reactor trip	<1,500
	Feedwater start up control valve lines	2 per cooldown, 2 per heatup	<1,500
	Final emergency feedwater lines to steam generator	1 per cooldown, 1 per emergency feedwater actuation, 1 per heatup	<2,500
	Recirculation cleanup lines	1 per cooldown, 1 per heatup	<1,000
Gaseous Waste Disposal	Quench tank vent lines to gaseous waste disposal vent header	1 per cooldown, 1 per heatup	<1,000

Table 4.3.3-2: 80-Year Thermal Cycle Projections for Non-Class 1 Piping Designed to ANSI B31.1 Code Requirements

Piping System	Description of System Locations	Conservative Assumption of Cycles	Projected Cycles for 80 Years
Heater Drain	Drain piping from heaters	1 per cooldown, 1 per heatup, 1 per reactor trip	<1,000
	Lines from flash tanks to the condenser	1 per cooldown, 1 per heatup, 1 monthly	<1,500
Heater Vents	Vent piping	1 per cooldown, 1 per heatup, 1 per reactor trip	<1,000
High Pressure Injection	Reactor coolant letdown and makeup lines	1 per cooldown, 1 per heatup, 1 per reactor trip	<1,000
	Reactor coolant pump seal return	1 per cooldown, 1 per heatup,	<1,000
High Pressure Turbine Exhaust	Extraction steam to high pressure feedwater heaters and condenser bypasses	1 per cooldown, 1 per heatup, 1 per reactor trip	<1,000
	First stage reheater heating steam supply and condensate drain	1 per cooldown, 1 per heatup, 1 per reactor trip	<1,000
	Moisture separator reheater steam supply and condensate drains	1 per cooldown, 1 per heatup, 1 per reactor trip	<1,000
Instrument Air	Backup instrument air compressor discharge lines to the aftercooler	Quarterly, 48 per year	<4,500

Table 4.3.3-2: 80-Year Thermal Cycle Projections for Non-Class 1 Piping Designed to ANSI B31.1 Code Requirements

Piping System	Description of System Locations	Conservative Assumption of Cycles	Projected Cycles for 80 Years
Low Pressure Injection	Reactor coolant drop line through the system back to the reactor vessel	2 per cooldown, 2 per heatup	<1,500
Low Pressure Service Water	Residual heat removal cooler discharge	2 per cooldown, 2 per heatup	<1,500
Low Pressure Turbine Extraction	Extraction steam to low pressure feedwater heaters and condenser drains	1 per cooldown, 1 per heatup, 1 per reactor trip	<1,000
Main Steam	Main steam lines	1 per cooldown, 1 per heatup	<1,000
	Second stage reheater steam supply and condensate drain	1 per cooldown, 1 per heatup, 1 per reactor trip	<1,000
	Shared steam startup headers	Monthly	<1,000
	Steam lines to feedwater pumps	1 per cooldown, 1 per heatup, 1 per reactor trip, 1 per EFW actuation	<3,000
	Steam to emergency feedwater pump turbine	1 per emergency feedwater actuation, Quarterly	<2,500
	Turbine bypass and condensate steam air ejector lines	1 per cooldown, 1 per heatup	<1,000

Table 4.3.3-2: 80-Year Thermal Cycle Projections for Non-Class 1 Piping Designed to ANSI B31.1 Code Requirements

Piping System	Description of System Locations	Conservative Assumption of Cycles	Projected Cycles for 80 Years
Plant Heating	Lines with steam for environment heating	1 per cooldown, 1 per heatup	<1,000
Reactor Coolant	Non-Class 1 vents and drains	1 per cooldown, 1 per heatup	<1,000
	Reactor coolant pump oil lift system	1 per cooldown, 1 per heatup	<1,000
Standby Shutdown Facility Air Intake and Exhaust	Diesel exhaust discharge lines	36 per year	<3,000
Standby Shutdown Facility Diesel Lube Oil	Diesel Lubricating oil lines	Monthly	<1,000
Steam Drain	General station steam line drains	1 per cooldown, 1 per heatup, 1 per reactor trip	<1,000
Steam Seals	Steam seal system	1 per cooldown, 1 per heatup	<1,000
Vacuum	Steam lines going into the condensate steam air ejectors	1 per cooldown, 1 per heatup	<1,000

Note 1: The pressurizer sample piping stress range reduction factor has been reduced from 1.0 to 0.7 to allow for a total of 45,000 thermal cycles.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii):

There are no portions of non-class 1 piping in scope for SLR that exceed the allowable number of thermal cycles; therefore, the stress range reduction factors applied to the piping systems remain valid in all locations. The plant analyses has been projected to the end of the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

4.3.4 ENVIRONMENTALLY-ASSISTED FATIGUE

Fatigue occurs in a metal component when it is subjected to fluctuating loads. The analysis must consider the effects of reactor water environment on fatigue. The Environmental-Assisted Fatigue discussion for Oconee is provided in Proprietary Report SLR-ONS-TLAA-0306P [Reference 4.3-12] and in the Non-Proprietary Report SLR-ONS-TLAA-0306NP [Reference 4.3-13]. The proprietary information is owned by both Duke Energy and Framatome and is annotated as such.

4.3.5 ANALYTICAL EVALUATION OF FLAWS

TLAA Description:

The ASME Section XI ISI requirements are contained in Subsection IWB for Class 1 pressure retaining components, Subsection IWC for Class 2 pressure-retaining components, and Subsection IWD for Class 3 pressure retaining components. ISI at Oconee has, in a number of instances, lead to the identification of crack-like indications (primarily in welds). For indications detected during ISI that exceed acceptance standards in IWB, IWC, and IWD (1) repairs may be made, (2) affected portions of the component may be replaced, or (3) the flaw may be shown to be acceptable through analytical evaluation.

Acceptance through analytical evaluation requires a prediction of crack growth through the end of service life of the component. The crack growth analysis is based on fracture mechanics techniques and helps determine the course of action required in the management of these flaws. Indications that are determined not to grow beyond an acceptable limit during the projected lifetime of the component are justified for continued operation. These crack growth analyses involve the same design thermal transient cycle assumptions considered in the original design. Because the crack growth rate determined by these analyses may further limit the design life of the components, a review of the transient cycle assumptions considered in these analyses is required in order to justify 80 years of operation.

TLAA Evaluation:

For initial license renewal, Duke identified several fracture mechanics analyses that were performed to the end of the service of the component at Oconee and then re-evaluated these analyses for applicability to the period of extended operation (60-years). The acceptable cycle count basis for several of these analyses required management under the current thermal fatigue management program. For SLR, Duke Energy again reviewed the status of those analyses and found that only some of those are still applicable to the current plant configuration. Additionally, Duke reviewed ISI records that included the third, fourth, and part of the fifth inspection intervals, the period since initial license renewal, to identify any new flaws that require evaluation for the subsequent period of extended operation.

The results of the SLR review of those still-applicable flaw growth analyses identified for initial LR found that all flaws where reduced numbers of acceptable cycles did require management under the thermal fatigue management program have either since been re-evaluated or the component containing the flaw has been replaced. Those reanalyzed flaws are now acceptable for their full controlling design basis transient cycles as discussed in Section 4.3.1.

The ISI record review to support SLR identified only one additional indication in an HPI piping weld in Oconee Unit 1. This flaw evaluation determined that the flaw would be acceptable for the full controlling design basis transient cycles as discussed in Section 4.3.1.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

Since the analytical evaluation of these flaws are acceptable for their full controlling design transient cycles, the effects of fatigue on the intended functions of the components containing these flaws will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) for the subsequent period of operation. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.6 WELD OVERLAY FATIGUE ANALYSIS

TLAA Description:

Structural weld overlays were installed on the pressurizer spray, pressurizer surge, reactor coolant system hot leg surge, reactor coolant system letdown, hot leg decay heat and safety and relief nozzles to eliminate concerns with stress corrosion cracking of Alloy 600. Analyses of the weld overlays for these locations includes both fatigue analyses and postulated flaw growth analyses.

Analysis of these locations also includes postulated flaw growth analyses. The flaw growth analyses are used to justify the service life of the weld overlays should one be needed. A review of the fatigue flaw growth analyses for the following weld overlays indicates no need to establish service limits when considering the thermal transients originally established for 40 years when projected to 80 years of operation.

- pressurizer spray nozzle weld overlay (all units)
- pressurizer safety relief valve nozzle weld overlay (all units)
- reactor coolant system hot leg surge nozzle weld overlay (Unit 1)

A review of the fatigue flaw growth analyses for the following weld overlays indicated the established service life limits. These service limits establish the required time frame for inspection of the associated weld overlays. Specifically, a 25% sample population of the weld overlays are inspected during each ASME Section XI, Inservice Inspection interval in accordance with the rules outlined Code Case N-770-5, Item F-1. This inspection is currently part of the Oconee Inservice Inspection Program. After a location is inspected and no flaw is detected the service life for these weld overlays resets. The following weld overlays contain a specified service life:

- pressurizer surge nozzle weld overlay (all units)
- reactor coolant system hot leg surge nozzle weld overlay (Units 2 and 3)
- hot leg decay heat nozzle weld overlay (all units)
- reactor coolant system letdown nozzle weld overlay (all units)

TLAA Evaluation:

The transient cycles considered in the weld overlays were projected for 80 years of operation as discussed in Section 4.3.1 and were found to be adequate for the subsequent period of extended operation. As reported in Table 4.3.1-1, the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. Therefore, the fatigue analyses for the weld overlays have adequate margin in order to remain valid for the subsequent period of extended operation. In order to ensure the design cycles remain bounding for the weld overlays, the *Fatigue Monitoring* AMP (B3.1) will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

A 25% sample population of the weld overlays will be inspected for cracking during the subsequent period of operation. The examinations will be performed in accordance with the rules outlined in Code Case N-770-5, Item F-1. The sample population for each unit will include the two most limiting overlays for each unit. These inspections will be managed by the *ASME Section XI Inservice Inspection, Subsection IWB, IWC, and IWD* AMP (B2.1.1).

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The effects of fatigue on the intended function(s) of the weld overlays will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) and the *ASME Section XI Inservice Inspection, Subsection IWB, IWC, and IWD* AMP (B2.1.1) through the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.7 REFERENCES

4.3-1 ONS UFSAR, Revision 28

4.3-2 NUREG-2192, Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants, Revision 0, July 2017

4.3-3 Oconee Nuclear Station, Units 1, 2, and 3 License Amendment Request for Measurement Uncertainty Recapture Power Uprate, February 19, 2020, ADAMS Accession Number ML20050D379

4.3-4 BAW-2248A, Demonstration of the Management of Aging Effects for the Reactor Vessel Internals, March 2000, ADAMS Accession Number ML003708443

4.3-5 BAW-1843PA, “Evaluation of Internals Bolting Concerns in 177 FA Plants,” Lynchburg, VA, January 1986, ADAMS Accession Number ML20197G640

4.3-6 ANP-3899P, Revision 0, Framatome Reactor Vessel Internals TLAA Input to the ONS SLRA, May 2021

4.3-7 ANP-3899NP, Revision 0, Framatome Reactor Vessel Internals TLAA Input to the ONS SLRA, May 2021

4.3-8 NRC Bulletin 88-11, Pressurizer Surge Line Thermal Stratification, dated December 28, 1988.

4.3-9 10 CFR Part 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants

4.3-10 BAW-10051, Revision 1, “Design of Reactor Internals and Incore Instrumentation Nozzles for Flow Induced Vibration,” September 1972, revised in November 1972. Acceptability of BAW-10051, Revision 1. ADAMS Accession No. 19316A566

4.3-11 ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Facility Components

4.3-12 SLR-ONS-TLAA-0306P, Revision 0, “Environmentally-Assisted Fatigue Oconee Subsequent License Renewal Application Supplemental Section 4.3.4”, May 2021

4.3-13 SLR-ONS-TLAA-0306NP, Revision 0, “Environmentally-Assisted Fatigue Oconee Subsequent License Renewal Application Supplemental Section 4.3.4”, May 2021

4.3-14 EPRI Technical Report 3002011822, Long-Term Operations: Subsequent License Renewal Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, April 2018

4.3-15 Not Used

4.3-16 NUREG-2191, Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report, Revision 0

4.3-17 Not Used

4.3-18 NUREG/CR-6260, Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components, March 1995

4.3-19 NUREG/CR-6583, Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels, February 1998

4.3-20 NUREG/CR-5704, Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels, April 1999

4.3-21 NUREG/CR-6909, Rev. 1, Effect of LWR Water Environments on the Fatigue Life of Materials, Final Report, May 2018

4.3-22 EPRI Technical Report 3002000505, Pressurized Water Reactor Primary Water Chemistry Guidelines, Volume 1, Revision 7, April 2014

4.3-23 ASME Boiler and Pressure Vessel Code, Section XI, Division 1, Non-mandatory Appendix L, Operating Plant Fatigue Assessment

4.3-24 ASME Code Case N-809, Reference Fatigue Crack Growth Rate Curves for Austenitic Stainless Steel in Pressurized Water Reactor Environments, Section XI, Division 1, ASME International, dated June 23, 2015.

4.3-25 Title 10 Code of Federal Regulations, 10 CFR 50.55a, Codes and Standards, U.S. Nuclear Regulatory Commission.

4.3-26 Oconee Nuclear Station, Units 1, 2 & 3 - NRC issuance of Amendment Numbers 420, 422 and 421 Measurement Uncertainty Recapture Power Uprate, dated January 26, 2021, ADAMS Accession Number ML20335A001

4.4 ENVIRONMENTAL QUALIFICATIONS OF ELECTRICAL EQUIPMENT

TLAA Description:

Thermal, radiation, and cyclical aging analyses of plant electrical and instrumentation components, developed to meet 10 CFR 50.49 requirements, have been identified as TLAAs. The NRC nuclear station EQ requirements in 10 CFR 50.49 require that an EQ program be established to demonstrate that certain electrical equipment located in harsh plant environments is qualified to perform applicable safety functions in those harsh environments after the effects of inservice aging. Harsh environments are defined as those areas of the plant that could be subject to the harsh environmental effects of a LOCA, HELB, and post-LOCA radiation. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of EQ.

Environmental Qualification Program Background:

10 CFR 50.49 requires that an EQ program be established to demonstrate that certain electrical components located in harsh plant environments are qualified to perform their safety function in those respective harsh environments after the effects of inservice (operational) aging. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of EQ. Those components with a qualified life equal or greater than the duration of the current plant operating term are covered by TLAA analyses.

The EQ program was evaluated against the Division of Operating Reactors (DOR), “Guidelines for Evaluating Qualification of Class 1E Electrical Equipment in Operating Reactors”, Inspection and Enforcement Bulletin (IEB) 79-01B, “Environmental Qualification of Class 1E Equipment”, and IEEE Standard 323-1974, “IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations,” as codified by 10 CFR 50.49. IEEE 323-1974 provides the criteria for safety related equipment (electrical “Class 1E” equipment) and the basis for categorizing equipment important to safety, and defines environmental service conditions (Reference 4.4-3). Therefore, the EQ program includes and identifies electrical equipment that is important to safety and that could be exposed to harsh environment accident conditions, consistent with 10 CFR 50.49. The Oconee EQ program was inspected in 1985 by the NRC and found to comply with the requirement of 10 CFR 50.49 (Reference 4.4-4). Ongoing self-assessments, such as the 2018 EQ readiness self-assessment, and NRC inspection ensures that the EQ program continues to comply with the requirement of 10 CFR 50.49.

As required by 10 CFR 50.49, EQ equipment not qualified for the current license term is refurbished or replaced, or has its qualified life extended through reanalysis or ongoing qualification prior to reaching the designated life aging limits established in the evaluation. Aging evaluations for EQ equipment that specify a qualified life of at least 60 years are TLAA for SLR.

Reanalysis of an aging evaluation to extend the qualified life of equipment qualified under the program requirements of 10 CFR 50.49(e) is performed as part of the EQ program. Important attributes for the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met).

TLAA Evaluation:

Environmental Qualification Reanalysis:

Reanalysis evaluates the original attributes, assumptions and conservatisms for environmental conditions and other factors of an aging evaluation to demonstrate that equipment qualified life can be extended. Reanalysis of equipment qualified under the program requirements of 10 CFR 50.49(e) is performed as part of an EQ program. Important attributes for the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions. These attributes are discussed in the "Environmental Qualification Equipment Reanalysis Attributes" section below.

Environmental Qualification Equipment Reanalysis Attributes:

The reanalysis of an existing aging evaluation is normally performed to extend the qualified life by reevaluating original attributes, assumptions and conservatisms in environmental conditions and other factors to identify excess conservatisms incorporated in the prior evaluation. Reanalysis of an aging evaluation to extend the qualified life of electrical equipment is performed pursuant to 10 CFR 50.49(e) as part of an EQ program. While an electrical equipment life limiting condition may be due to thermal, radiation, or cyclical aging, the majority of electrical equipment aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed service conditions or unrealistically low activation energy. The reanalysis of an aging evaluation is performed according to the station's quality assurance (QA) program requirements, which requires the verification of assumptions and conclusions including the maintenance of required margins.

As already noted, important attributes of a reanalysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions. These attributes are discussed below.

Analytical Methods:

The analytical models used in the reanalysis of an aging evaluation are the same as those previously applied during the prior evaluation. The Arrhenius methodology is an acceptable thermal model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation is to demonstrate qualification for the total integrated dose that includes normal radiation dose for the projected installed life plus accident radiation dose. For SLR, one acceptable method of establishing the 80-year normal radiation dose is to multiply the initial 40-year normal radiation dose by two. The result is added to the accident radiation dose to obtain the total integrated dose for the component. For cyclical aging, a similar approach may be used. Other models may be justified on a case-by-case basis.

Data Collection and Reduction Methods:

The identification of excess conservatism in electrical equipment service conditions used in the prior aging evaluation is the chief method used for a reanalysis. For example, temperature data, associated margins, and uncertainties used in an equipment EQ evaluation may be based on anticipated plant design temperatures found to be conservative when compared to actual plant temperature data. When used, plant environmental data may be obtained from monitors used for technical specification compliance; other installed monitors, measurements made by plant operators during rounds, dedicated monitors for EQ equipment or combinations of the above. The environmental data gathering and analysis method can be used to identify conservatism in the original qualification and justify additional qualified life for the EQ equipment. Any changes to material activation energy values included as part of a reanalysis are justified by the applicant on a component-specific basis.

Underlying Assumptions:

EQ equipment aging evaluations account for environmental changes occurring due to plant modifications, seasonal changes, and events. A reanalysis demonstrates that adequate margin is maintained consistent with the original analysis in accordance with 10 CFR 50.49. 10 CFR 50.49 requires further consideration of certain margins and accounting for unquantified uncertainties such as diffusion limited oxidation, activation energy, synergistic effects, inverse temperature, and dose rate effects. Reanalysis that utilizes initial qualification conservatisms and/or inservice environmental conditions (e.g., actual temperature and radiation conditions) are part of an EQ program.

Acceptance Criteria and Corrective Actions:

Reanalysis of an aging evaluation is used to extend the qualified life of the component. If the qualified life cannot be extended by reanalysis, the equipment is refurbished, replaced, or requalified prior to exceeding the current qualified life. A reanalysis is performed in a timely manner to ensure sufficient time is available to refurbish, replace, or requalify the equipment if the result is unfavorable.

A modification to qualified life by reanalysis must demonstrate that adequate margin is maintained consistent with the original analysis including unquantified uncertainties established in the original EQ equipment aging evaluation.

Environmental Qualification Ongoing Qualification:

Ongoing qualification, for the purposes of this document is defined as the process of requalifying a component through activities similar to the original qualification which may include testing, type testing, or a monitoring program. When assessed, if margins, conservatisms, or assumptions do not support extending qualified life, the following methods may be used:

- The retention and continued aging of a test sample from the original EQ test program with demonstration that the qualified life is bounding for the SPEO.
- Removal and type testing of additional EQ equipment installed in identical service conditions with a greater period of operational aging.
- Monitoring Program - Requires that EQ equipment characteristics subject to aging degradation be monitored at specific intervals and compared to specified acceptance criteria. The acceptance criteria are based on the capability of post aging characteristics for the EQ equipment to retain functional properties during and after

enduring design bases environment, as applicable. Condition monitoring intervals are established to prevent age degradation beyond the acceptance criteria prior to corrective action.

The above methods are considered ongoing qualification. Other methods or approaches may be acceptable. A modification to extend qualified life must be justified including program documentation and auditable evidence that adequate margin is maintained consistent with the original analysis including unquantified uncertainties established in the original EQ equipment aging evaluation.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The implementation of the enhanced EQ AMP (B3.3) provides reasonable assurance that thermal, radiation, and cyclical aging effects will be adequately managed so that the intended functions of components within the scope of license renewal will be maintained during the SPEO.

4.4.1 REFERENCES

4.4-1 SLR-ONS-AMPR-X.E1, Revision 1, “EQ of Electrical Equipment.”

4.4-2 AD-EG-ALL-1612, Revision 6, Environmental Qualification (EQ) Program.

4.4-3 IEEE Std. 323-1974, “IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations.”

4.4-4 NRC Letter (J.F. Stolz) to Duke Power (H. B. Tucker), Environmental Qualification of Electrical Equipment Important to Safety, March 20, 1985.

4.5 CONCRETE CONTAINMENT UNBONDED TENDON PRESTRESS ANALYSIS

TLAA Description

The Oconee containment buildings are post-tensioned, reinforced concrete structures composed of vertical cylinder walls and a shallow dome, supported on a conventional reinforced concrete base slab. The cylinder wall is prestressed by 176 vertical tendons anchored at the top surface of the upper ring girder at the top of the concrete cylinder and at the bottom of the foundation slab and six groups of 105 hoop tendons plus two additional tendons enclosing 120° of arc for a total of 632 tendons anchored at the six vertical buttresses. The dome is prestressed by three groups of 54 tendons oriented at 120° to each other for a total of 162 tendons anchored at the vertical face of the upper ring girder. Each tendon consists of 90 wires bundled together.

Over time, the containment prestressing forces decrease due to relaxation of the steel tendons and due to creep and shrinkage of the concrete. The containment tendon prestressing forces were calculated during the original design considering the magnitude of the tendon relaxation and concrete creep and shrinkage over the 40-year life of the plant. The *Concrete Containment Unbonded Tendon Prestress* AMP (B3.4) perform periodic surveillances of individual tendon prestressing values. Predicted lower limit force values are calculated for each tendon prior to the surveillances to estimate the magnitude of the tendon relaxation and concrete creep and shrinkage for the given surveillance period. The prestressing forces are measured and plotted, and trend lines are developed, to ensure the average tendon group prestressing values remain above the respective minimum required values until the next scheduled surveillance. The predicted lower limit force values and regression analyses, utilizing actual measured tendon forces, are used to evaluate the acceptability of the containment structure to perform its intended function over the current 60-year life of the plant, and therefore, are TLAAs requiring evaluation for the SPEO.

TLAA Evaluation

The prestress of containment tendons decreases over time as a result of elastic shortening of concrete, creep of concrete, shrinkage of concrete, relaxation of prestressing steel, and friction losses. At the time of initial licensing, the magnitude of the prestress losses throughout the life of the plant was predicted and the estimated final effective preload at the end of 40 years was calculated for each tendon type. The final effective preload was then compared with the minimum required preload to confirm the adequacy of the design. The estimated final effective prestressing force at the end of plant life was projected to 60 years during the original license renewal process. Described below is the summary of the evaluation for 80 years.

Predicted Lower Limit

The containment tendon prestressing force values were calculated during the original design of the containment structure to determine the initial prestressing force required for each tendon group such that the prestressing force would remain above the respective minimum required values over the 40-year life of the plant. The initial tendon prestressing force was calculated for each tendon type to compensate for the steel tendon relaxation and friction losses as well as concrete elasticity, creep, and shrinkage so that the estimated final effective tendon prestressing force at the end of the 40 years would be higher than the minimum required values. The estimated final effective prestressing force was extended to 60 years during the original license renewal process. As part of the *ASME Section XI, Subsection IWL* (B2.1.29) AMP inspections related to tendon examinations, a predicted lower limit force value is calculated for each tendon group scheduled for examination, for the given surveillance year. The predicted lower limit force values are developed consistent with the guidance presented in Regulatory Guide 1.35, considering the average values for the tendon groups. Actual measured values for each tendon are compared to their respective predicted lower limit values, with acceptance criteria consistent with *ASME Section XI, Subsection IWL* (B2.1.29) requirements.

Regression Analysis

A regression analysis is developed for each of the three tendon groups to determine the trend over time in prestressing values of individual tendons within each tendon group. The regression analysis consists of a trend line utilizing actual, representative individual tendon prestressing forces measured during successive *ASME Section XI, Subsection IWL* (B2.1.29) surveillances, consistent with NRC Information Notice 99-10, Attachment 3. The trend lines are periodically updated with new tendon prestressing force data following each surveillance. The trend lines are used to demonstrate that the average group prestressing forces will remain above the group minimum required value until the next scheduled surveillance, and potentially for the life of the plant.

The original ONS tendon surveillance requirements were not in accordance with *ASME Section XI, Subsection IWL*. The examined tendons were preselected and a fixed population, so that as a result the same tendons were inspected by lift-off tests for all surveillances. The surveillance program consisted of periodic inspections of nine predesignated tendons; three horizontal, three vertical, and three dome tendons on each unit. One of the three tendons in each group was detensioned and retensioned for wire sample removal on a rotational basis. As a result of repeated detensioning and retensioning, tendons were damaged to the extent that they were precluded from future lift-off tests. It was concluded that the repeated lift-off testing of the fixed sample of tendons could not be used to truly represent the tendon forces in the group as common tendons. The results of the sixth tendon inspection for Unit 3 showed low tendon forces, which were attributed mostly to the repeated testing of the same tendons. As a result, ONS submitted and had approved in 1997 a Technical Specification change [Reference 4.5-11] so that instead of using nine fixed tendons (i.e., three from each group), 11 representative tendons (five hoop, three vertical, and three dome) would be selected randomly with one in each group to be kept unchanged for the subsequent inspection. The original ONS tendon prestressing force examination results are not included in the current trend lines, except for the test results from the first year, since the results do not truly represent the tendon forces in the group as common tendons and can result in misleading trend lines if included, due to the wire removal and retensioning of the tendons.

The tendon prestressing force examination results for those hoop and vertical tendons that were retensioned or replaced as part of the steam generator replacement project have not been included in the development of trend lines for the hoop and vertical tendons. These tendons constitute a subgroup of hoop and vertical tendons due to the different maintenance history. There are too few examination results for these tendons to create a trend line for these subgroups and the measured tendon prestress values are significantly higher than the original tendons so that if included, the trend line would become unconservative. The examination results for these subgroups currently exceed the minimum required value and predicted lower limit.

Evaluation

The regression analyses associated with the tendons have been reanalyzed to extend the trend lines from 60 years to 80 years. The extended trend lines have been calculated using individual tendon prestressing force values based on data incorporating the latest surveillances for Oconee. In all cases, the regression analyses predict the prestressing forces will remain above the respective group minimum required values through the SPEO.

Figures 4.5-1 through 4.5-9 contain the reanalyzed regression analyses of the original tendons for each tendon group at Oconee. Extended trend lines have been developed for all tendons within the respective group, including the control tendons, and plotted with the minimum required values and predicted lower limits over the 80 year period.

Figures 4.5-10 through 4.5-15 contain the data plots of the tendons that were retensioned or replaced as part of the steam generator replacement project. There are too few examination results for these tendons to create a trend line for these subgroups and the measured tendon prestress values are significantly higher than the original tendons. The examination results for these subgroups currently exceed the minimum required value and predicted lower limit and are expected to remain so during the SPEO.

The *Concrete Containment Unbonded Tendon Prestress* AMP (B3.4) will monitor and manage the TLAA and the associated loss of tendon prestressing forces during the SPEO. The regression analyses are periodically updated following successive surveillances to ensure that estimated values remain above the minimum required values until the next scheduled surveillance, and potentially for the life of the plant. Individual measured tendon prestressing forces will be compared to predicted lower limit values and trend lines developed for the SPEO.

Predicted lower limit lines and trend lines of measured prestressing forces have been established for applicable tendon groups through the SPEO as part of the *Concrete Containment Unbonded Tendon Prestress* (B3.4) AMP. The predicted final effective preload at the end of 80 years exceeds the minimum required preload for all containment tendons. Consequently, the post-tensioning system will continue to perform its intended function throughout the SPEO.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The *Concrete Containment Unbonded Tendon Prestress* (B3.4) AMP and *ASME Section XI, Subsection IWL* (B2.1.29) AMP will manage the effects of aging related to prestress forces on the containment tendon prestressing system so that the intended function will be adequately managed for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Figure 4.5-1: Unit 1 Vertical Tendons - Original Tendons

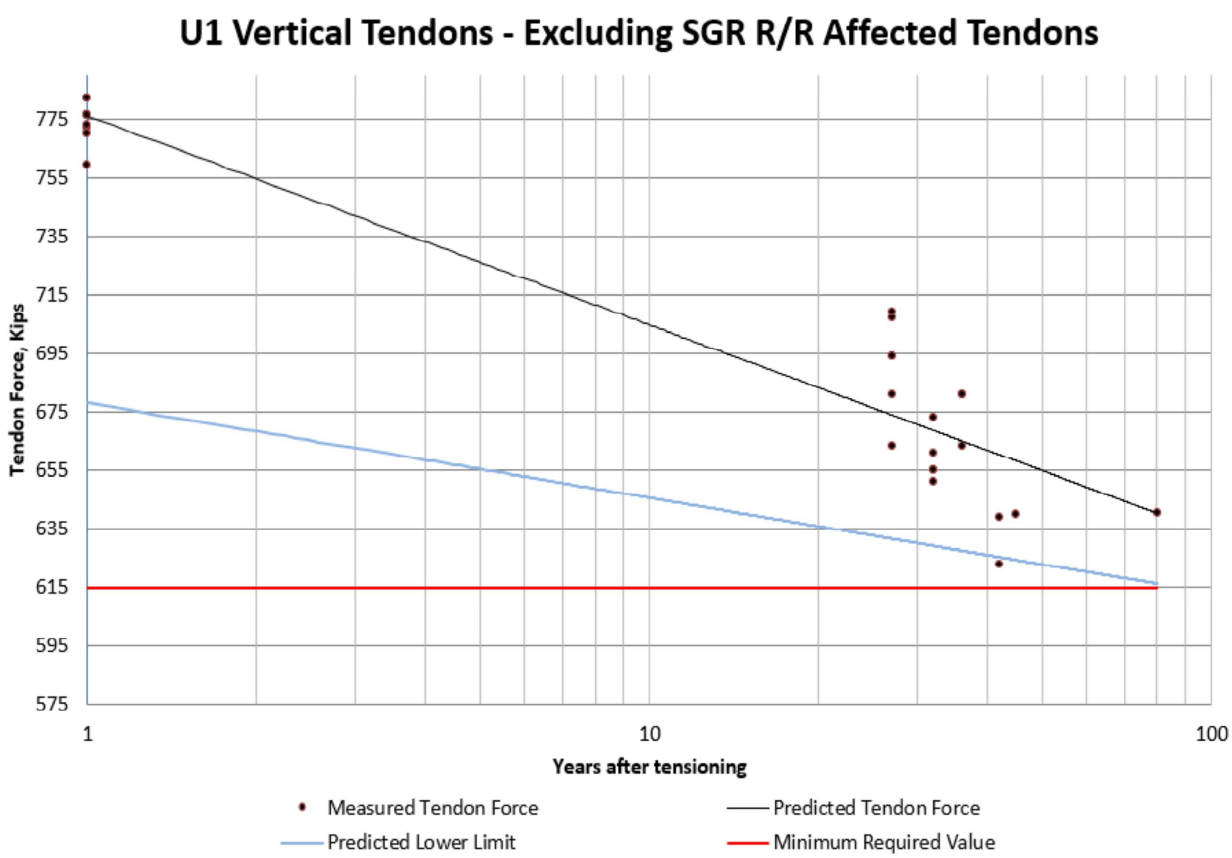


Figure 4.5-2: Unit 1 Hoop Tendons - Original Tendons

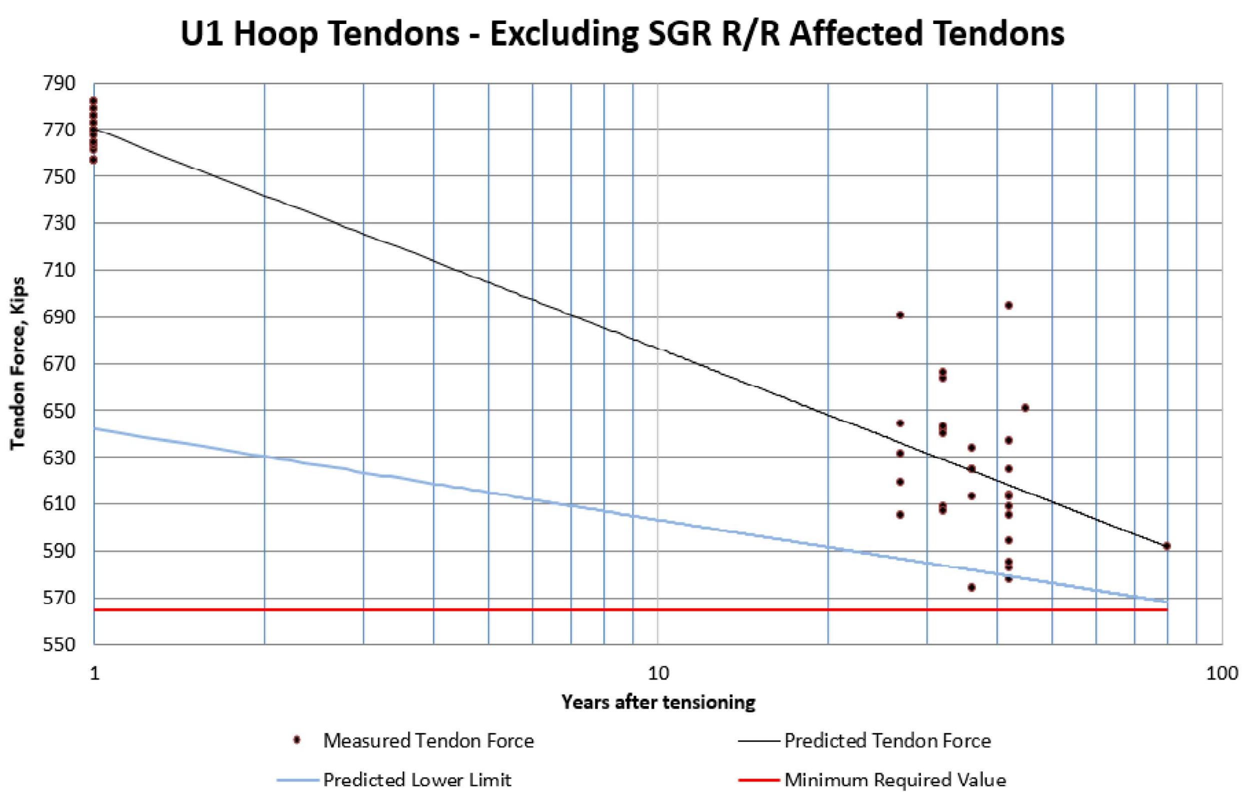


Figure 4.5-3: Unit 1 Dome Tendons - Original Tendons

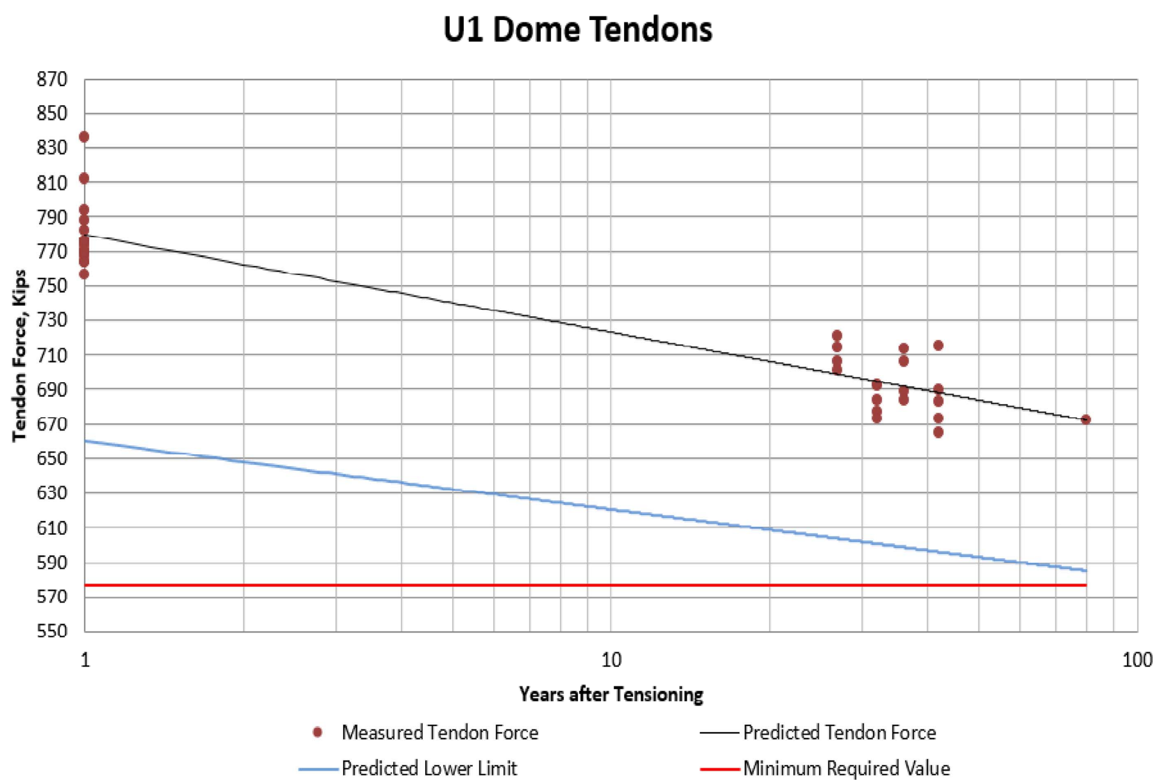


Figure 4.5-4: Unit 2 Vertical Tendons - Orinignal Tendons

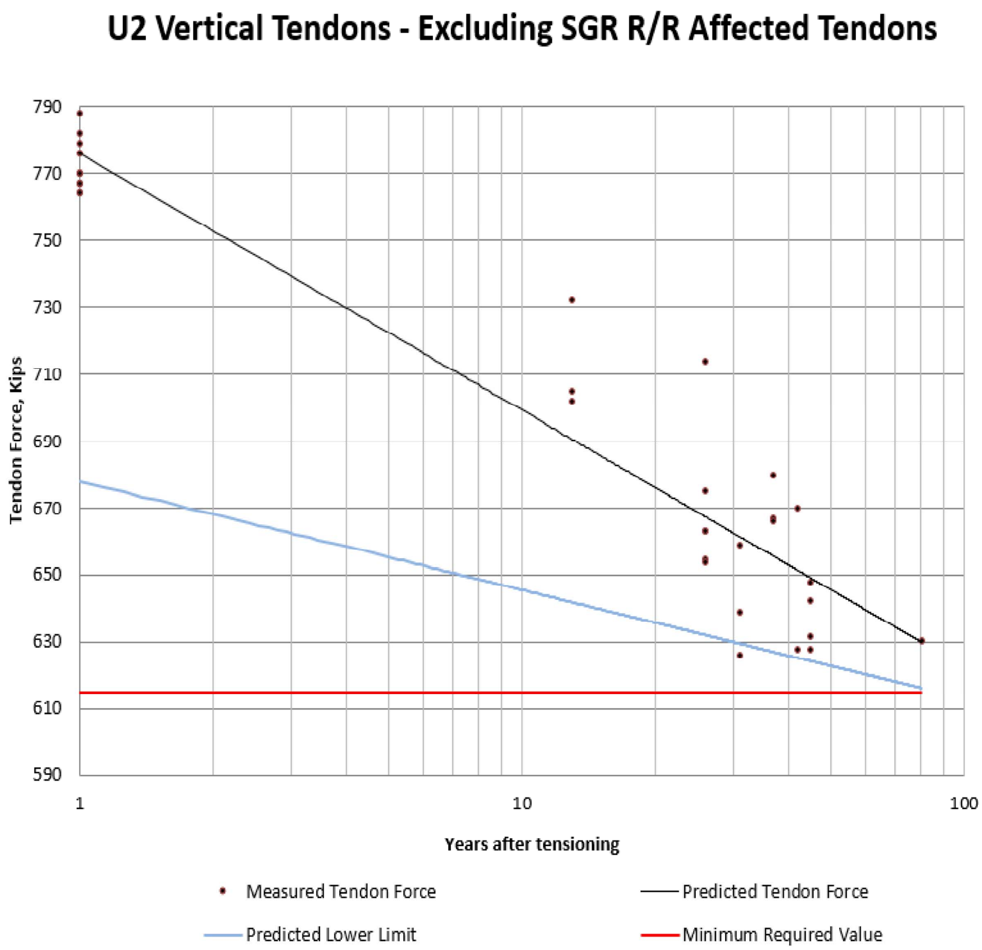


Figure 4.5-5: Unit 2 Hoop Tendons - Original Tendons

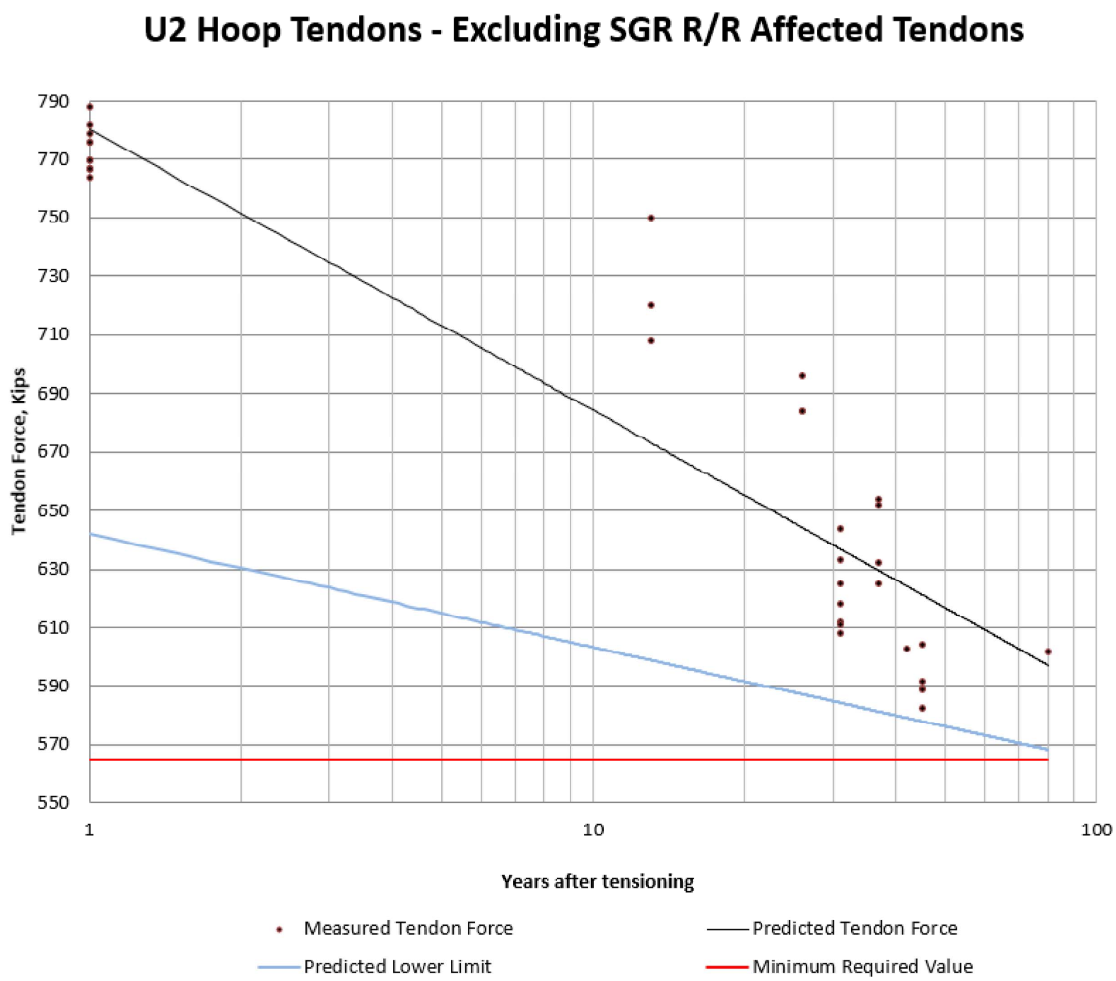


Figure 4.5-6: Unit 2 Dome Tendons – Original Tendons

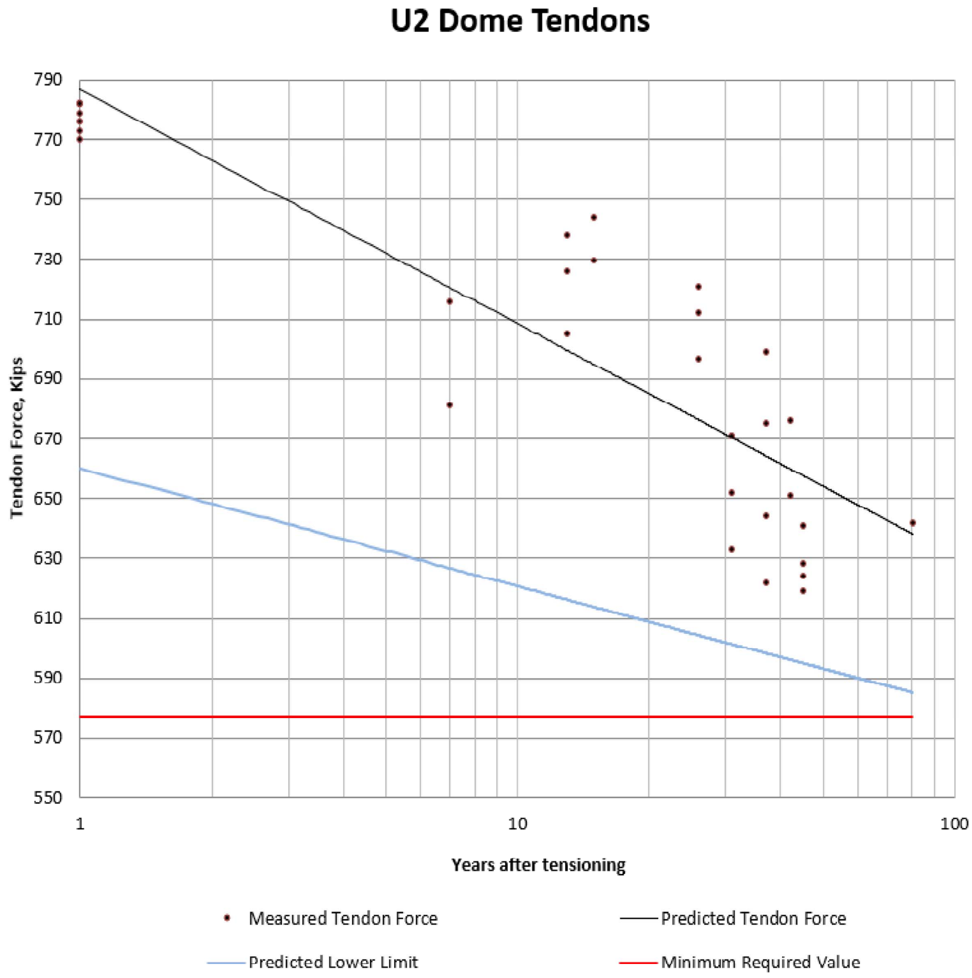


Figure 4.5-7: Unit 3 Vertical Tendons – Original Tendons

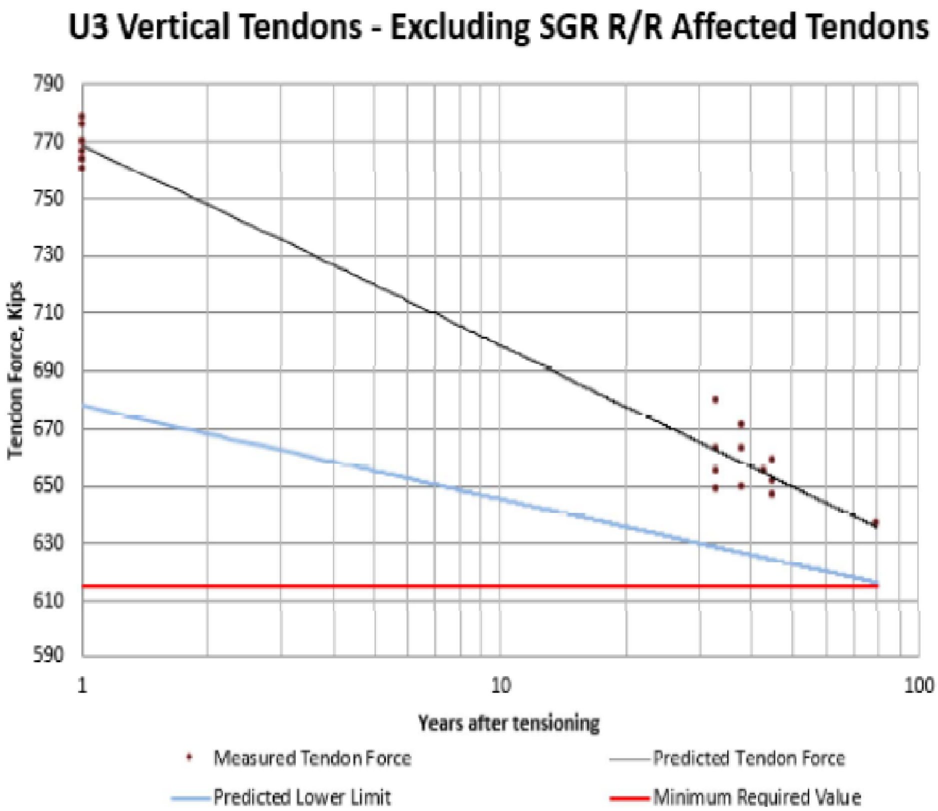


Figure 4.5-8: Unit 3 Hoop Tendons – Original Tendons

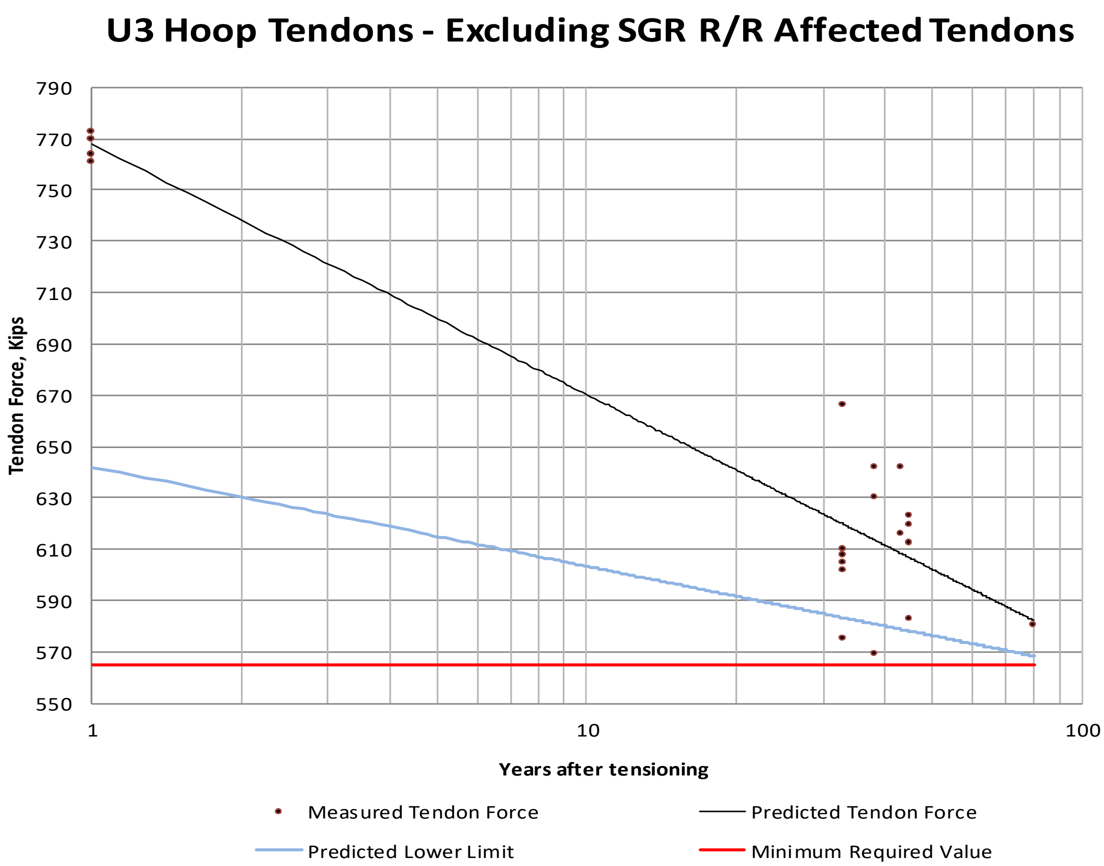


Figure 4.5-9: Unit 3 Dome Tendons – Original Tendons

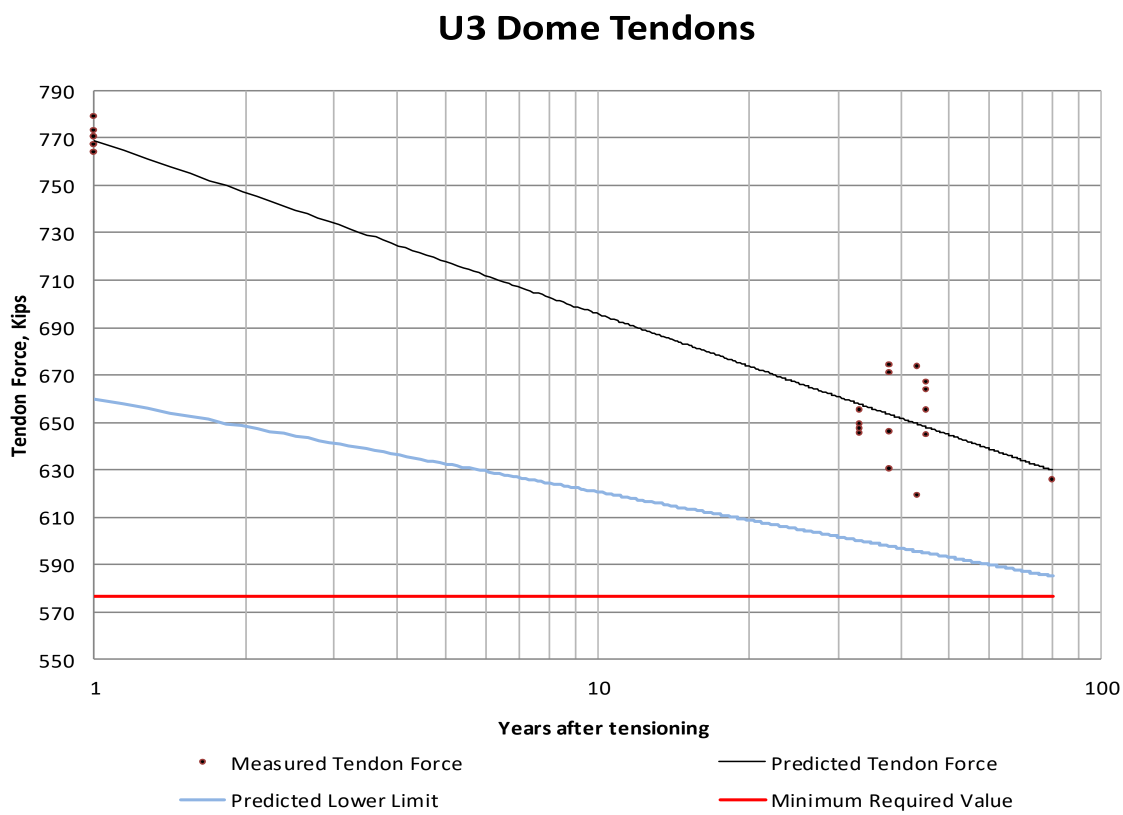
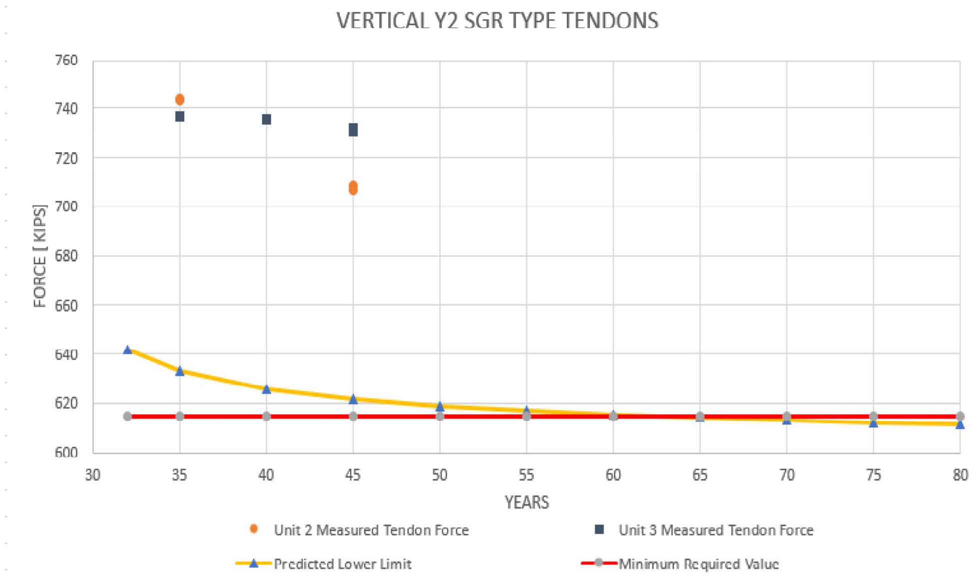


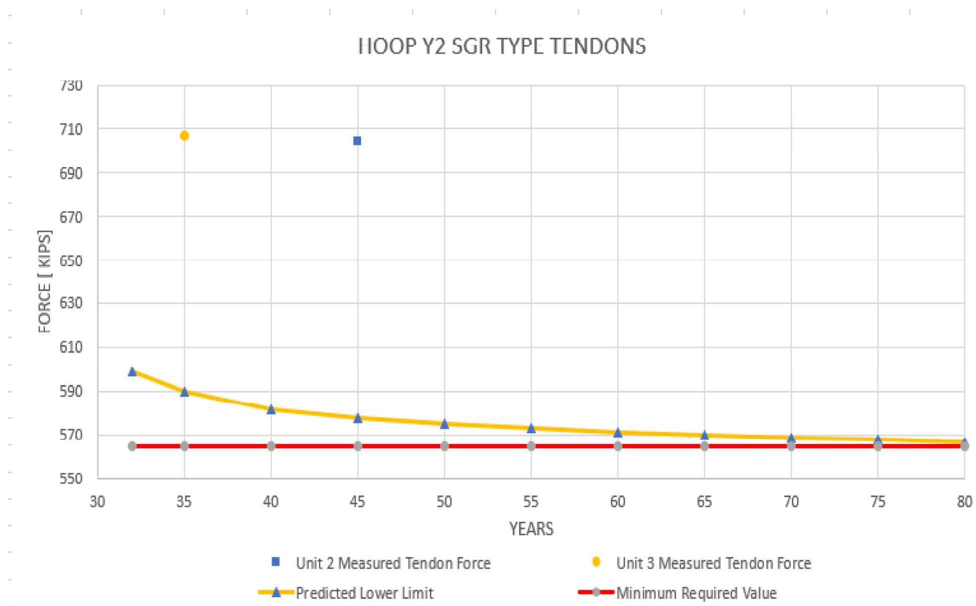
Figure 4.5-10: Units 1, 2, and 3 – Steam Generator Replacement Type Y2 Tendons – Vertical



Unit 1 does not have any Y2 tendons. Unit 1 Y2 tendons were replaced during the Steam Generator Replacement project, not retensioned.

Unit 2 and 3 Y2 tendons are original tendons that were retensioned as part of the Steam Generator Replacement project.

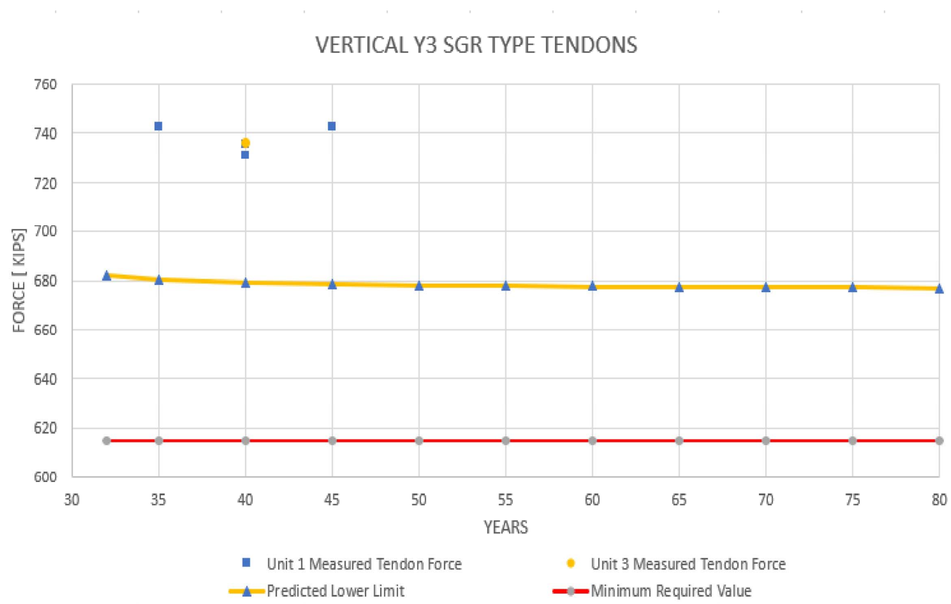
Figure 4.5-11: Units 2 and 3 – Steam Generator Replacement Type Y2 Tendons – Hoop



Unit 1 does not have any Y2 tendons. Unit 1 Y2 tendons were replaced during the Steam Generator Replacement project, not retensioned.

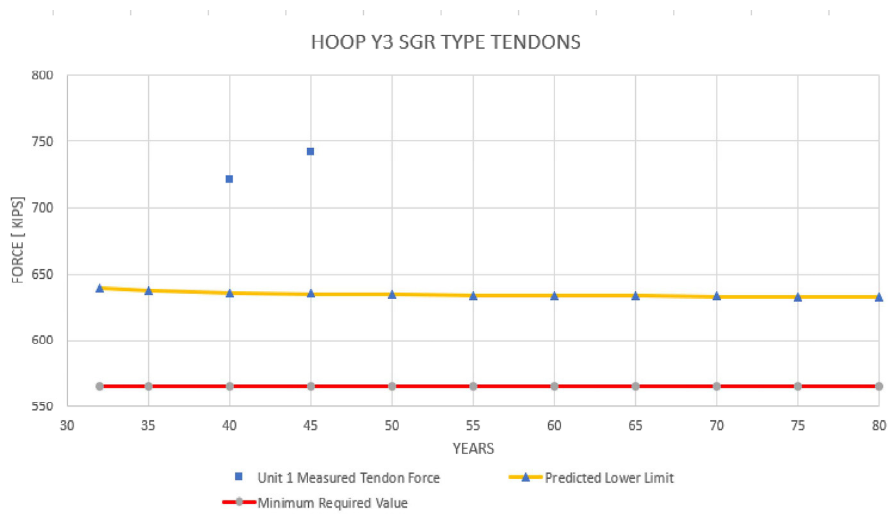
Unit 2 and 3 Y2 tendons are original tendons that were retensioned as part of the Steam Generator Replacement project.

Figure 4.5-12: Units 1 and 3 – Steam Generator Replacement Type Y3 Tendons – Vertical



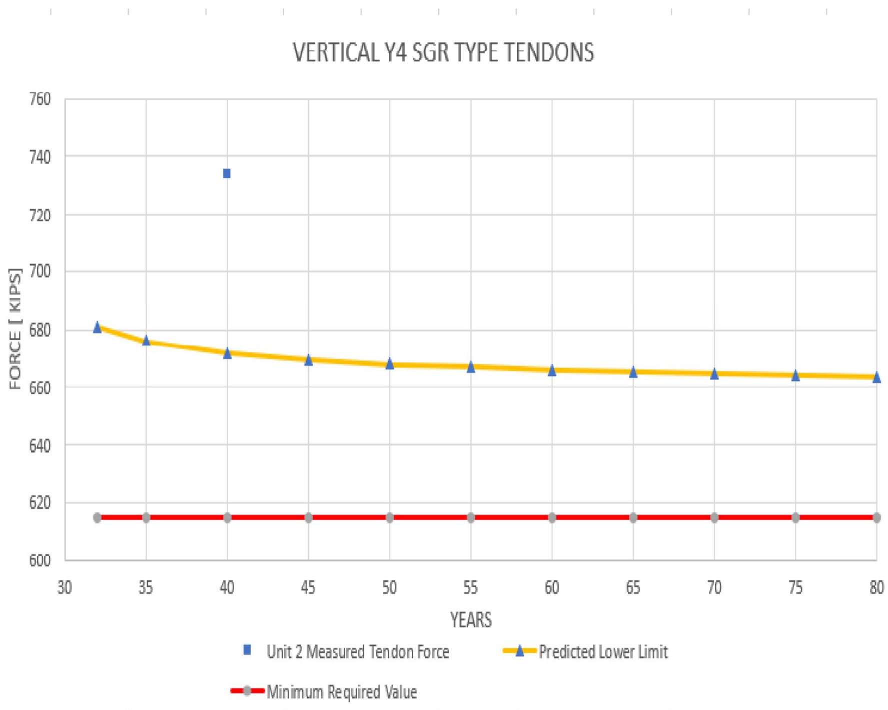
Y3 Tendons are new tendon wires tensioned in original concrete.

Figure 4.5-13: Unit 1 – Steam Generator Replacement Type Y3 Tendons – Hoop



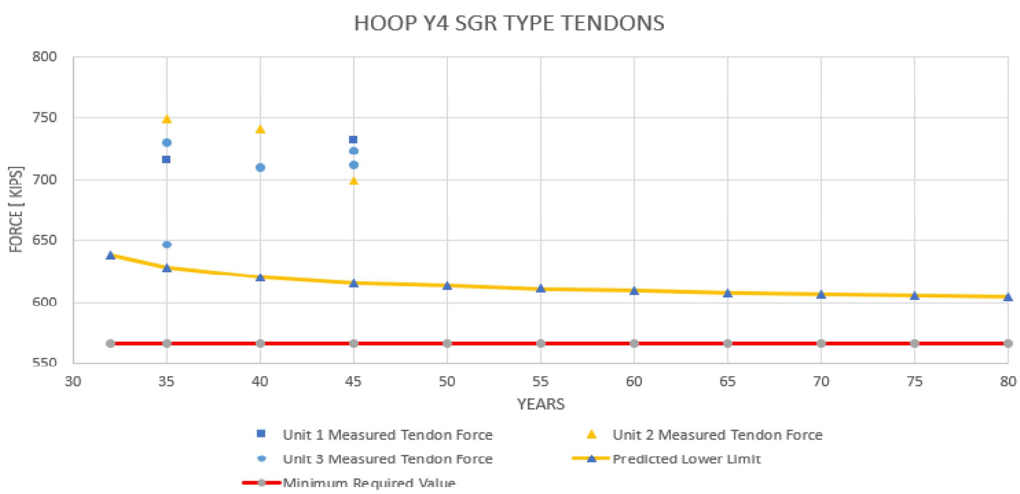
Y3 Tendons are new tendon wires tensioned in original concrete.

Figure 4.5-14: Unit 2 – Steam Generator Replacement Type Y4 Tendons – Vertical



Y4 Tendons are new tendon wire tensioned in new concrete (Steam Generator Replacement patched opening).

Figure 4.5-15: Units 1, 2, and 3 – Steam Generator Replacement Type Y4 Tendons – Hoop



Y4 Tendons are new tendon wire tensioned in new concrete (Steam Generator Replacement patched opening).

4.5.1 REFERENCES

4.5-1 10 CFR Part 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants

4.5-2 10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities

4.5-3 Regulatory Guide 1.35.1, Determining Prestressing Forces for Inspection of Prestressed Concrete Containments Revision, July 1990

4.5-4 NRC Information Notice 99-10, Revision 1, Degradation of Prestressing Tendon Systems In Prestressed Concrete Containments, Attachment 3, October 7, 1999

4.5-5 NUREG-2192, Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants, July 2017

4.5-6 NUREG-1723, Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3, March 2000, ADAMS Accession Number ML003695154

4.5-7 ONS UFSAR, Revision 28, Section 3.8.1

4.5-8 Not Used

4.5-9 Selected License Commitment (SLC) 16.6.2 – Containment Tendon Surveillance Program

4.5-10 Not Used

4.5-11 Oconee Nuclear Station, Units 1, 2 & 3, License Amendment Request to Revise Reactor Building Structural Integrity Technical Specifications regarding the tendon surveillance program, September 15, 1997, ADAMS Accession Number ML012000495

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENTS AND PENETRATION FATIGUE ANALYSIS

4.6.1 CONTAINMENT LINER PLATE

TLAA Description:

The interior surface of the containments for Oconee Units 1, 2, and 3 are lined with a ¼” thick welded steel plate to provide an essentially leak-tight barrier. At all penetrations, the liner plate is thickened to reduce stress concentrations. The following fatigue loads were considered in the design of the liner plate, as described in USFAR Section 3.8.1.5.3, and are considered to be time-limited aging analyses for the purpose of license renewal:

(a) Thermal cycling due to annual outdoor temperature variations. The number of cycles for this loading is 40 cycles for the plant life of 40 years. The Oconee liners plates are positioned on the interior of the Containment and are shielded from the outdoor environments by an approximately 3-3/4 ft wall of concrete. The change in temperature from the outer surface of the concrete to the inner surface would be insignificant from a thermal fatigue impact. Furthermore, increasing the 40 cycles to 80 cycles for 80 years of operation would be considered insignificant in comparison to the assumed 500 thermal cycles due to variations of containment interior temperature during heatup and cooldown of the reactor coolant system.

(b) The combined loading of thermal cycling due to reactor building interior temperature varying during the startup and shutdown of the reactor coolant system and Type A integrated leak rate tests required by 10 CFR 50, Appendix J, including any Type A tests that may be performed if major modifications or repairs are made to the containment pressure boundary. The number of cycles for this loading is assumed to be 500 cycles. This loading is the governing design aspect that is the focus to be evaluated for the SPEO.

(c) Thermal cycling due to the LOCA will be assumed to be one cycle. This is not a time-limited design parameter.

(d) Thermal load cycles in the piping system are somewhat isolated from the liner plate penetrations by concentric sleeves between the pipe and the liner plate. The attachment sleeve is designed in accordance with ASME Section III considerations. All penetrations are reviewed for a conservative number of cycles to be expected during the plant life in Section 4.6.3.

TLAA Evaluation:

The associated temperature and pressure changes from reactor coolant system heatups and cooldowns and Type A integrated leak rate test are the main contributors to fatigue of the containment liner plate. The design of the containment liner relied on a cumulative number of 500 cycles for these transients, which control the other design parameters of the liner plate.

The ONS UFSAR, Table 5-2, provides the 40-year design transient number of 360 heatup and cooldown cycles for the reactor coolant system. The projected number of cycles for each ONS unit through 80 years of operation has been determined to be less that the original 360 cycle design limits as shown in Table 4.3.1-1. Periodic Type A integrated leak rate tests are additional major sources of load changes. These Type A loads are considered within the set of design loads whose cumulative total was assumed to be 500 cycles. For license renewal it was projected that there would be a total of 11 Type A tests performed per unit, with 7 being documented for each unit in 1998. This would result in approximately 25 Type A tests per each unit to the end of the SPEO.

Combining the total number of cycles for outdoor temperature variations, the total number of Type A tests, and the projected heatups and cooldowns from Table 4.3.1-1 would result in a transient cycle count less than 500 cycles. Therefore, it is concluded that thermal fatigue of the containment liner would be acceptable for the SPEO. The *Fatigue Monitoring* AMP will track cycles for significant fatigue transients listed in Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii)

The effects of fatigue on the intended function(s) of the containment liner plate will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) for the SPEO.

As described in UFSAR Section 3.8.1.5.3, the only portions of the liner plate that contain fatigue analysis are those thickened portions at the penetrations. The containment penetration fatigue analysis is contained in Section 4.6.3 and validates these sections of the liner plate. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.6.2 METAL CONTAINMENT

Each unit has a concrete containment with a metal liner. Therefore, the topic of metal containment fatigue analysis is not applicable.

4.6.3 CONTAINMENT PENETRATIONS FATIGUE ANALYSIS

TLAA Description:

The interior surface of the containment is lined with welded steel plate to provide an essentially leak tight barrier. At all penetrations, the liner plate is thickened to reduce stress concentrations of the liner plate. Oconee Units 1, 2 and 3 process lines that penetrate the primary containment and experience significant thermal expansion and contraction are solidly anchored to the containment wall. These high temperature lines penetrating the containment wall and liner plate are the main steam and main feedwater lines.

The primary containment penetrations were originally designed to ASME Section III [Reference 4.6-1]. The original design was to the 1965 Code Edition, which was revised for the main steam and main feedwater penetrations to ASME Section III, Subsection NE and NC, 1992 Edition with 1992 Addenda. Fatigue loads were considered in the current analysis of the main steam and main feedwater piping penetrations. The main steam and main feedwater penetrations are reviewed for a conservative number of cycles to be expected during plant life which are less than the 40-year design cycles.

TLAA Evaluation:

The transient cycles count assumptions related to the main steam and main feedwater penetrations analyses begins with information updated since initial design and applicable for the current operating period. The controlling transients for the penetrations are a specific subset of governing transients listed in Table 4.3.1-1. The cycle count assumptions associated with these two penetration sets have been refined from the original design and new values established for the current operating period. These refined cycle count assumptions are the basis for the SLR evaluation. Specifically, the main steam penetrations have refined cyclic limits associated with heatups, cooldowns, and reactor trips. The main feedwater penetrations have refined cyclic limits associated with heatups, cooldowns, and seismic loads.

Using the refined transient cycle count values, the main steam and main feedwater cycle counts were projected for 80 years as shown in Table 4.6.3-1 and the projected values bound the SPEO. In order to ensure the refined, current operating period cycles remain bounding for the main steam and main feedwater penetrations, the *Fatigue Monitoring* AMP will track the governing transients for these penetrations, using the refined, current operating period cycle count and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The effects of fatigue on the intended functions of the containment penetrations piping will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.6.3-1: ONS Main Steam and Main Feedwater Containment Penetrations

Name	Governing Transient	40-Year Design Allowable Cycles	Refined Allowable Cycles	Current Count[2]	Projected for 80 years[1]
Main Steam Reactor Building Penetrations	1A Heatup[3]	360	262	125	189
	1B Cooldown[3]	360	262	131	197
	Total Reactor Trips[4]	412	262	135	194
Main Feedwater Reactor Building Penetrations	1A Heatup[3]	360	249	125	189
	1B Cooldown[3]	360	249	131	197

Note 1: The projected 80 year cycles are from Table 4.3.1-1
Note 2: The current count is the maximum accrued cycles from each Oconee unit
Note 3: These governing transients include seismic loads
Note 4: The total number of reactor trips comes from the addition of transients 8A, 8B, 8C, and 8D from Table 4.3.1-1

4.6.4 REFERENCES

4.6-1 ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Facility Components, 1965 Code Edition

4.6-2 Oconee Nuclear Station UFSAR, Revision 28

4.7 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

The following plant-specific safety analysis involve time-limited assumptions and are presented in this section.

- Reactor Vessel Internals - Reduction in Fracture Toughness due to Neutron Embrittlement (Section 4.7.1.1)
- Reactor Vessel Internals - Flow Induced Vibration Endurance Limits (Section 4.7.1.2)
- Reactor Vessel Internals - Irradiation Embrittlement (Section 4.7.1.3)
- Reactor Vessel Underclad Cracking (Section 4.7.2)
- Reactor Coolant Pump Flywheel Fatigue Crack Growth Analyses (Section 4.7.3)
- Leak-Before-Break Analysis for Reactor Coolant System Piping (Section 4.7.4)
- Crane Load Cycle Limits (Section 4.7.5)

4.7.1 REACTOR VESSEL INTERNALS

4.7.1.1 Reduction in Fracture Toughness due to Neutron Embrittlement

TLAA Description:

Framatome Topical Report BAW-10008, Part 1, Revision 1, June 1970 [Reference 4.7-1] documents the acceptability of the reactor vessel internals under LOCA and a combination of LOCA and seismic loadings. The effect of irradiation on the material properties and deformation limits for the internals is presented in Appendix E where it is concluded that at the end of 40 years, the internals will have adequate ductility to absorb local strain at the regions of maximum stress intensity, and that irradiation will not adversely affect deformation limits. Because the conclusion is based on a fluence determination of 40 years of operation, this meets the definition of 10 CFR 54.3(a) and was identified as TLAA.

Framatome Topical Report BAW-2248A [Reference 4.7-2] states that this TLAA will be resolved on a plant-specific basis per 10 CFR 54.21 (c)(1)(iii). Plant-specific analysis is required to demonstrate that, under LOCA and seismic loading and with irradiation accumulated at the expiration of the period of extended operation, the internals have adequate ductility to absorb local strain at the regions of maximum stress intensity and will meet the deformation limits. Subsequently, in a letter to the NRC dated December 17, 1999 [Reference 4.7-3], Duke committed to perform the plant-specific analysis and develop data to demonstrate that the internals will meet the deformation limits at the expiration of the renewal license. In response, the NRC in its SER related to the license renewal of three Oconee units, determined that this program will adequately manage the irradiation aging effect in accordance with 10 CFR 54.21 (c)(1)(iii) [Reference 4.7-4] for the 60-year period.

In a letter to the NRC dated February 20, 2012 [Reference 4.7-5], Duke submitted the plant-specific analysis constituting the updated TLAA for reduction of fracture toughness of the reactor vessel internals for NRC staff review. The NRC reviewed the licensee's basis for the update of the reduction of ductility TLAA for the three Oconee units [Reference 4.7-6] and determined that:

- The licensee has projected the neutron fluence for the reactor vessel internals for the 60-year period using an acceptable methodology consistent with RG 1.190.

- The licensee compiled test data from materials irradiated in operating light-water reactors, plus the Halden test reactor. These materials were irradiated under conditions more similar to the conditions of the ONS, 1, 2, and 3 reactor vessel internals and therefore should more accurately represent the behavior of the Type 304SA (solution annealed) material in the ONS 1, 2 and 3 reactor vessel internals. The newer test data, when plotted on the original graph, confirms the conservatism of the original figure.

- The licensee's evaluation of the deformation limits of BAW-10008, Part 1, Revision 1, considering the change in tensile properties of the Type 304SA material due to irradiation, is correct.

- The licensee appropriately revised Appendix E of BAW-10008, Part 1, Revision 1 to conclude the reactor vessel internals would have adequate ductility at 60 years (54 EFPY) to withstand the postulated LOCA plus seismic event.

- The disposition of the TLAA for loss of fracture toughness was not changed by this analysis. Since the NRC staff-approved disposition of this TLAA is that aging will be adequately managed in accordance with 10 CFR 54.21(c)(1)(iii), the licensee must reevaluate this TLAA if new relevant data on loss of ductility of irradiated stainless steel is generated.

Based on the above, the NRC staff concluded that the licensee's evaluation of the TLAA for reduction of ductility of the reactor vessel internals is acceptable, and the license renewal commitment documented in Section 4.2.5.3 of NUREG-1723 to perform a plant-specific analysis and develop data to demonstrate that the internals will meet the deformation limits at the expiration of the 60-year renewed license, is fulfilled. Therefore, this TLAA must be re-evaluated for subsequent license renewal.

<u>TLAA Evaluation:</u>

Section 3.2 of BAW-10008, Part 1, Revision 1 notes that there are two primary safety considerations that govern the deformation limits of the internals: deformation shall not prevent insertion of control rods, nor shall it prevent adequate post-accident cooling of the core. The resultant faulted condition stresses (Case IV) are provided in Table 1 of BAW-10008, Part 1, Revision 1. Each reactor vessel internals item listed in Table 1 of BAW-10008, Part 1, Revision 1 is assessed in accordance with one of three process steps (i.e., Categories 1-3) for Faulted Conditions to determine if each reactor vessel internals item should be considered potentially susceptible to an unacceptable amount of reduction of ductility at 72 EFPY. This assessment is

similar to that submitted and approved by the NRC for the Davis-Besse Nuclear Power Station, Unit 1 for the period of 60-year license renewal [References 4.7-7 and 4.7-8].

For completeness, stress calculations (developed after the data reported in Table 1 of BAW-10008, Part 1, Revision 1) applicable to the Oconee units were reviewed to ensure that the original design basis calculations reported in Table 1 of BAW-10008, Part 1, Revision 1 capture the limiting reactor internals items for reduction of ductility. Recent stress calculations included asymmetric loading stress calculations for faulted conditions reported in BAW-1621, related to NRC request for additional information, and the Oconee final SER [References 4.7-9, 4.7-10, 4.7-11], and original and replacement high-strength bolting stress calculations. BAW-1621 is not identified as TLAA but is included for completeness since it contains faulted load stress intensities that post-date the stress intensities reported in BAW-10008, Part 1, Revision 1. The three process steps (i.e., Categories 1-3) to determine the impact of reduction of ductility at 72 EFPY on each item (in order of evaluation) are as follows:

1. Determine if the faulted stress intensity for the reactor vessel internals item is less than the unirradiated ASME B&PV Code yield strength at operating temperature (600 ^{o}F) and therefore plasticity will not occur at 72 EFPY. Since the material remains elastic (and neutron embrittlement would increase the yield strength), reduction of ductility is acceptable.

2. Determine if the reactor vessel internals item is already highly irradiated (i.e., only reactor vessel internals items directly adjacent to the fuel assemblies - e.g., baffle plates), such that the Case IV faulted stress intensity remains below the irradiated yield strength (increases as fluence increases) and plasticity will not occur at 72 EFPY. Since the material remains elastic, with large margin to the irradiated yield strength, reduction of ductility is acceptable.

3. Determine if the expected fluence exposure is low enough such that neutron embrittlement is considered negligible, reduction of ductility is minimal or will not occur at 72 EFPY and unirradiated ductility properties are still applicable.

For each process step, further evaluation is required for those items that do not satisfy the screening criterion defined within each process step. For example, items that do not fall below the yield strength criterion in Category 1 are carried forward to Category 2. Category 2 items, developed from the first process step that do meet the irradiated yield strength criterion are carried forward to Category 3. Items that exceed the Category 3 screening criterion require further evaluation to demonstrate that those internals items will have sufficient ductility at 72 EFPY to meet the deformation limits at the expiration of the SPEO. The detailed process step evaluation and results are reported in Proprietary Report ANP-3899P, Revision 0 and in Non-Proprietary Report ANP-3899, Revision 0 [References 4.7-12 and 4.7-16] and are summarized below. Reference to a reactor vessel internals item is equivalent to a part or parts (e.g., plenum cylinder or guide tubes).

BAW-10008, Part 1, Revision 1 Assessment per Criterion Defined by Category 1

For the Category 1 assessment, the faulted stress intensity for each the reactor vessel internals item is compared to the unirradiated ASME B&PV Code yield strength for the applicable material type at operating temperature (i.e., about 550°F to 600°F). For those reactor vessel internals items that have a reported stress intensity value less than the unirradiated ASME B&PV Code yield strength at 600°F, the material should remain elastic (and neutron embrittlement would increase the yield strength), reduction of ductility is acceptable; therefore, no further analysis is required. The unirradiated ASME B&PV Code yield strength (S_y) values at 600°F for the reactor vessel internals items materials of interest are presented in Table 4.7.1-1. Reactor vessel internals items reported in BAW-10008, Part 1, Revision 1, Table 1, that satisfy Category 1 screening criterion are reported in, Table 4.7.1-2 as “Category 1” in the last column. Seven items were carried forward to Process Step 2: lower grid plate, plenum cover, plenum cylinder reinforcing plate, core support shield top flange, core support shield lower flange, baffle plates, and upper core barrel bolts for Oconee Unit 3 only.

Table 4.7.1-1: ASME B&PV Code Yield Strength Values at 600°F

Temperature (ºF)	Yield Strength (psi) of Type 304 (e.g., SA-240)	Yield Strength (psi) of Type 304L (e.g., SA-240)	Yield Strength (psi) of Alloy A-286 (e.g., SA-453 Grade 660	Yield Strength (psi) of Alloy X-750 (SB-637, Grade 688, Type 3)
600	17,300	14,400	81,000	92,500

BAW-10008, Part 1, Revision 1 Assessment per Criterion Defined by Category 2

For the Category 2 assessment, the expected reactor vessel fluence (E > 1.0 MeV) at 72 EFPY of the applicable ONS reactor vessel internals items listed in Table 1 of BAW-10008, Part 1, Revision 1 are reviewed to determine if the item is highly irradiated to the level where saturation of the material’s yield strength has occurred. Only reactor vessel internals items directly adjacent to the fuel assemblies are expected to be highly irradiated. For the case where the item is highly irradiated at 72 EFPY and the Case IV faulted stress intensity is below the irradiated yield strength (which increases as fluence increases), plasticity will not occur at 72 EFPY; therefore, the material remains elastic with large margin to the irradiated yield strength, and the reduction of ductility is acceptable.

Based on the 72 EFPY fluence estimates (see Section 4.7.1.3) for the stress types of the seven items identified in Table 4.7.1-2 where the Case IV faulted stress intensities are greater than the unirradiated yield strengths at 600°F, only the baffle plates are expected to be highly irradiated. The baffle plates Case IV faulted stress intensity in Table 1 of BAW-10008, Part 1, Revision 1, is less than the irradiated saturated yield strength; therefore, the baffle plate material remains elastic with large margin to the irradiated yield strength, and reduction of ductility is acceptable and no further analysis is required.

For the remaining six reactor vessel internals items identified in Table 4.7.1-2 where the Case IV faulted stress intensities are greater than the unirradiated yield strengths at 600°F, further assessment in accordance with criteria defined by Category 3 is performed to determine if the remaining reactor vessel internals items should be considered potentially susceptible to reduction of ductility at 72 EFPY. The six items carried forward to process step 3 include the lower grid plate, plenum cover, plenum cylinder reinforcing plate, core support shield top flange, core support shield lower flange, and upper core barrel bolting for Oconee Unit 3 only.

<u>BAW-10008, Part 1, Revision 1 Assessment per Criterion Defined by Category 3</u>

For the remaining six Oconee reactor vessel internals items not screened out by the Category 1 and 2 assessments above, a review is performed to determine if the expected fluence (E > 1.0 MeV) of the reactor vessel internal item is low enough such that neutron embrittlement is considered negligible at 72 EFPY, thus reduction of ductility is minimal or will not occur at 72 EFPY for the item.

The projected 72 EFPY fluence values for the remaining 6 reactor vessel internals items are reported in Reference 4.7-12 and were developed based on extrapolation of 60-year reactor vessel internals transport calculations that were developed using the Regulatory Guide 1.190 compliant methodology developed for the reactor vessel as described in BAW-2241PA, Revision 2 [Reference 4.7-20]. These are best estimate fluence values and are discussed in Section 4.7.1.3 below. When the projected 72 EFPY fluence values reported in Proprietary Report ANP-3899P, Revision 0 and in Non-Proprietary Report ANP-3899, Revision 0 are applied to Figure E-3 of BAW-10008, Part 1, Revision 1, the uniform elongation for the plenum cover, plenum cylinder reinforcing plate, and core support shield top flange at both 572°F and 752°F (temperatures between which these component items would be expected to experience) is such that the 20 percent uniform elongation of irradiated material credited for 40 years in Appendix E of BAW-10008, Part 1, Revision 1 is met for these materials. Accordingly, these component items will have adequate ductility to absorb local strain at the regions of maximum stress intensity, and irradiation will not adversely affect deformation limits. This is noted by a “Category 3” entry in the last column of Table 4.7.1-2.

For the three remaining reactor vessel internals items (i.e., lower grid plate, core support shield lower flange, and upper core barrel bolts at Oconee Unit 3), further evaluation is required to demonstrate that those internals items will have sufficient ductility at 72 EFPY to meet the deformation limits at the end of the SPEO. As such, a “further evaluation required” entry is noted in the last column of Table 4.7.1-2.

As noted previously, this review included asymmetric loading stress calculations for faulted conditions reported in BAW-1621, Supplement 1 related request for additional information, and NRC SER on *“Asymmetric LOCA Loads, Oconee 1, 2 and 3”* provided by letter dated May 20, 1983 (Reference 4.7-11), and original and replacement high-strength bolting stress calculations. BAW-1621 is not identified as a TLAA but is included for completeness since it contains faulted load stress intensities that post-date the stress intensities reported in BAW-10008, Part 1, Revision 1. The three-step process described above for BAW-10008, Part 1, Revision 1, was repeated for the stress intensities reported in BAW-1621, Supplement 1 and original and replacement high-strength bolting stress calculations, and the results are summarized in Table 4.7.1-3.

Based on the results of the categorization assessments reported in Table 4.7.1-2 and Table 4.7.1-3, the following reactor vessel internals items were determined to be potentially susceptible to reduction of ductility at 72 EFPY and require further evaluation. Duplicate item results between the two evaluations are double underlined.

From Table 4.7.1-2, regarding BAW-10008, Part 1, Revision 1:

1. Lower grid plate (i.e., lower grid rib section)
2. Core support shield lower flange
3. Upper core barrel bolts (ONS-3 only based on stress analysis of the current ONS-3 upper core barrel bolting configuration)

From Table 4.7.1-3, regarding RAI responses to BAW-1621, Supplement 1:

1. Upper core barrel bolts (ONS-3 only based on stress analysis of the current ONS-3 upper core barrel bolting configuration)
2. Core support shield lower flange
3. Lower grid rib section
4. Lower grid rib section/lower grid shell forging joint bolt
5. Support post/support forging joint – weld
6. Upper grid rib section
7. Upper grid pad joint – bolt

To reconcile these reactor vessel internal items for the SPEO, a set of recalculated loads based on smaller break loadings due to LBB of the primary piping were calculated for six of the seven items/welds, excluding the Oconee Unit 3 upper core barrel bolts. Comparison of these recalculated loads showed that, for the six reactor vessel internals items/welds, the recalculated faulted condition stress intensity values are less than the unirradiated ASME Code yield strength at 600°F. Thus, reduction of ductility is acceptable for these six items or welds and no further analysis is required.

For assessment of the Oconee Unit 3 upper core barrel bolts, measured yield strength values at temperatures 600ºF and greater were located during a record search. This data shows that at these elevated temperatures, the measured yield strength values of these tested materials are greater than the calculated stresses for the ONS-3 upper core barrel bolts. Therefore, by comparison, the reduction of ductility is acceptable for the ONS-3 upper core barrel bolts and no further analysis is required.

Therefore, based on the assessments of the effect of irradiation on the mechanical properties and deformation limits of the Oconee reactor vessel internals, reduction of ductility for the reactor vessel internals items listed in Table 1 of BAW-10008, Part 1, Revision 1 is considered acceptable and remains valid for an 72 EFPY lifetime for the reactor vessel internals at all three Oconee units.

TLAA Disposition: 10 CFR 54.21(c)(1)(iii):

The effect of irradiation on the material properties and deformation limits of the reactor vessel internals at all three units at Oconee, as reported in BAW-10008, Part 1, Revision 1, is acceptable for an 72 EFPY lifetime such that the Internals will have adequate ductility to absorb local strain at the regions of maximum stress intensity, and that irradiation will not adversely affect deformation limits under faulted condition loadings. The analyses reported in BAW-10008, Part 1, Revision 1, remain valid for the subsequent period of extended operation and are managed by the PWR Vessel Internals Program (B2.1.7, GALL-SLR XI.M16A), consistent with the current licensing basis [Reference 4.7-6]. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii). The reactor vessel internals 72 EFPY fluence/ displacement per atom values used to disposition the Category 2 and 3 items above are projected to the end of the subsequent period of extended operation in accordance with 54.21(c)(1)(ii) as discussed in Section 4.7.1.3.

Table 4.7.1-2: Reduction of Ductility Reconciliation of Faulted Component Items from Table 1 of BAW-10008, Part 1, Revision 1

Component Item	Material	Stress Type	Category Reconciliation
Lower grid plate Outlet pipe rupture	Type 304	$P_L + P_b$	Further Evaluation Required
Inlet pipe rupture		$P_L + P_b$	Further Evaluation Required
Plenum cover	Type 304	$P_L + P_b$	Category 3
Plenum cylinder reinforcing plate	Type 304	$P_L + P_b$	Category 3
Upper guide tubes	Type 304L	P_m	Category 1
		$P_L + P_b$	Category 1
Upper guide tube sectors	Type 304L	$P_L + P_b$	Category 1
Core support shield, top flange Subcooled portion of LOCA	Type 304	P_m	Category 3
		$P_L + P_b$	Category 3
Saturated portion		P_m	Category 1
		$P_L + P_b$	Category 3

Table 4.7.1-2: Reduction of Ductility Reconciliation of Faulted Component Items from Table 1 of BAW-10008, Part 1, Revision 1 (Continued)

Component Item	Material	Stress Type	Category Reconciliation
Core support shield, lower flange Subcooled portion of LOCA	Type 304	P_m	Category 1
		$P_L + P_b$	Further Evaluation Required
Saturated portion of LOCA		P_m	Category 1
		$P_L + P_b$	Further Evaluation Required
Core barrel, top flange Subcooled portion of LOCA	Type 304	P_m	Category 1
		$P_L + P_b$	Category 1
Saturated portion of LOCA		P_m	Category 1
		$P_L + P_b$	Category 1
Baffle plates	Type 304	$P_L + P_b$	Category 2
Internals bolts Core barrel-core support shield joint	Alloy A-286	P_m	Category 1, exception ONS-3 bolts require further evaluation
		$P_L + P_b$	Category 1, exception ONS-3 bolts require further evaluation
Core barrel-lower grid cylinder joint	Alloy A-286	P_m	Category 1
		$P_L + P_b$	Category 1

Table 4.7.1-3: Reduction of Ductility Reconciliation of Faulted Component Items from BAW-1621 Supplement 1

Component Item	Material	Stress Type	Category Reconciliation
Core Support Shield Assembly			
Core Support Shield	Type 304	P_m	Category 1
		Buckling	N/A
Core Support Shield/Core Barrel Bolted Joint	Alloy A-286	P_m	Category 1, exception ONS-3 bolts require further reconciliation
Core Barrel Upper Flange	Type 304	P_m	Category 1
		Bearing	N/A
		Shear	N/A
Core Support Shield Lower Flange	Type 304	P_m	Category 1
		$P_m + P_b$	N/A
		Bearing	N/A
Core Support Shield Upper Flange	Type 304	Load Limit, kips	N/A
Lower Grid Assembly			
Core Barrel/Lower Grid Assembly Bolts	Alloy A-286	P_m	Category 1
		Stripping	N/A

Table 4.7.1-3: Reduction of Ductility Reconciliation of Faulted Component Items from BAW-1621 Supplement 1

Component Item	Material	Stress Type	Category Reconciliation
		Bearing	N/A
Core Barrel Lower Flange	Type 304	P_m	Category 1
Grid Pad	Type 304	Bearing	N/A
Grid Pad/Rib Section Joint – Bolt	Grade B8	P_m	Category 1
Grid Pad/Rib Section Joint – Dowel	Alloy X-750	Shear	N/A
Rib Section	Type 304	P_m	Further Reconciliation Required
		$P_m + P_b$	Further Reconciliation Required
Support Post/Rib Section Joint – Bolt	Grade B8	P_m	Category 1
Rib Section/Lower Grid Shell Forging Joint Bolt	Grade B8	P_m	Further Reconciliation Required
Support Posts	Type 304	P_m	Category 1
Flow Distributor Plate	Type 304	P_m	Category 1
Flow Distributor Plate/Lower Grid Shell Forging Joint – Weld	Type 308/308L	P_m	Category 1
Support Post/Flow Distributor Plate Welded Joint	Type 308L	P_m	Category 1

Table 4.7.1-3: Reduction of Ductility Reconciliation of Faulted Component Items from BAW-1621 Supplement 1

Component Item	Material	Stress Type	Category Reconciliation
Support Forging	Type 304	P_m	Category 1
		$P_m + P_b$	Category 1
Support Post/Support Forging Joint – Weld	Type 308/308L	P_m	Further Reconciliation Required
Lower Grid Shell Forging	Type 304	P_m	Category 1
Flow Distributor Assembly			
Flow Distributor Head/Lower Grid Assembly Bolts	Alloy A-286	P_m	Category 1
		Tear-out	N/A
		Bearing	N/A
Flow Distributor Shell	Type 304	P_m	Category 1
		$P_m + P_b$	Category 1
Flow Distributor Flange	Type 304	P_m	Category 1
		$P_m + P_b$	Category 1
Core Barrel Assembly			
Core Barrel	Type 304	P_m	Category 1
		Buckling	N/A
Baffle-Former A-A Bolts	Grade B8	P_m	Category 1

Table 4.7.1-3: Reduction of Ductility Reconciliation of Faulted Component Items from BAW-1621 Supplement 1

Component Item	Material	Stress Type	Category Reconciliation
Barrel-Former A-A Bolts	Grade B8	P_m	Category 1[(a)]
Thermal Shield Lower End	Type 304	P_m	Category 1
Thermal Shield Upper End	Type 304	P_m	Category 1
Thermal Shield/Lower Grid Shell Forging Bolts	Alloy X-750	P_m	Category 1
Thermal Shield Upper Restraint	Type 304	Bearing	N/A
		Shear	N/A
Bolts	Alloy A-286	P_m	Category 1
Dowels	Alloy A-286	Shear	N/A
Plenum Assembly			
Plenum Cover	Type 304	Bearing	N/A
Plenum Cylinder	Type 304	P_m	Category 3
		Buckling	N/A
CRGT Slotted Region	Type 304	P_m	Category 1
		Buckling	N/A
CRGT Perforated Region	Type 304	P_m	Category 1
		Buckling	N/A

Table 4.7.1-3: Reduction of Ductility Reconciliation of Faulted Component Items from BAW-1621 Supplement 1

Component Item	Material	Stress Type	Category Reconciliation
CRGT Lower Joint – Bolt	Grade B8	P_m	Category 1
CRGT Lower Joint – Dowel	Type 304	Shear	N/A
CRGT/Plenum Cover Joint	Type 308L	P_m	Category 1
Upper Grid Rib Section	Type 304	P_m	Category 1
		$P_m + P_b$	Further Reconciliation Required
Upper Grid Pad Joint – Dowel	Alloy X-750	Dowel	N/A

Note (a): Based on a review of B&W fabrication records, the lowest measured room temperature yield strength was obtained for the barrel to former bolts. Per empirically based correlations between yield strength and temperature for unirradiated stainless steels, it is estimated that the barrel-former bolts measured yield strength at 600^{o}F is above the faulted stress intensity and reduction of ductility is acceptable.

4.7.1.2 Reactor Vessel Internals Flow Induced Vibration Endurance Limits

TLAA Description:

As reported in NUREG-1723 [Reference 4.7-4], SER Related to the LR of Oconee Nuclear Station, Units 1, 2, and 3, Page 4-23, includes the following regarding this TLAA. In Section 5.4.3 of Exhibit A of the ONS LRA [Reference 4.7-13] the applicant states that TLAA applicable to the ONS vessel internals are addressed in topical report BAW-2248A [Reference 4.7-2], *Demonstration of the Management of Aging Effects for the Reactor Vessel Internals*. TLAA identified in the LRA include:

- Flow-induced vibration endurance limit assumptions
- Transient cycle count assumptions for the replacement bolting
- Reduction in fracture toughness

The LRA states that the *Reactor Vessel Internals* program will assure that appropriate action is taken in a timely manner to ensure continued validity of the design of the reactor vessel internals.

The 60-year evaluation of flow-induced vibration endurance limit assumptions is reported in BAW-2248A, Section 4.5.1, flow-induced vibration endurance limit assumptions. NRC acceptance of this TLAA evaluation is contained in the NRC Safety Evaluation to BAW-2248A (NRC SER, Section 3.4.1) and is summarized in NUREG-1723, Pages 4-23 and 4-24. As such, this TLAA must be updated for SLR.

TLAA Evaluation:

The source references that were used to justify the B&W reactor pressure vessel internals flow-induced vibration endurance limit assumptions for 60 years were reviewed and updated for applicability to 80 years. The rationale and methods that are applied to SLR for 80 years are identical to those previously considered for 60 years but augmented with additional justification to conservatively address environmental assisted fatigue affects utilizing the environmental assisted fatigue criteria developed in NUREG/CR-6909, Revision 1 [Reference 4.7-15]. In addition, the more limiting fatigue curves published in the 2013 edition of the ASME Section III code (compared to the 1986 edition used with the ONS LRA for 60 years) are considered with the fatigue evaluation of the B&W reactor vessel internals.

Reference 4.7-16 provides a summary of the flow-induced vibration stress associated with the B&W reactor vessel internals and bolting items. The item with the least margin reported in Reference 4.7-16 has a stress for the thermal shield upper support bolts that is smaller than the allowable cyclic stress. Therefore, a safety factor exists between the maximum flow-induced vibration stress and the allowable cyclic stress from the fatigue curve for this limiting location. Since this stress is below the endurance limit, the maximum fatigue usage factor associated with flow-induced vibration for the reactor vessel internals is below the endurance limit for an 80 year life. These results are in part based upon the original justification of the B&W reactor vessel internals for a 40 year design life, provided in BAW-10051 Revision 1 and BAW-10051 Supplement 1 [Reference 4.7-17 and Reference 4.7-18].

TLAA Disposition: 10 CFR 54.21(c)(1)(ii):

The flow-induced vibration integrity of the ONS reactor vessel internals and bolting is deemed acceptable for SLR for 80 years in accordance with 10 CFR 54.21(c)(1)(ii). The high cycle fatigue affects associated with flow-induced vibration during the SPEO (60 to 80 years) and the concerns associated with the environmental fatigue affects have no impact upon the BAW-10051 analyses and thus have been demonstrated not to be detrimental to the flow-induced vibration performance of the ONS reactor vessel internals and bolting. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

4.7.1.3 Reactor Vessel Internals Irradiation Embrittlement

TLAA Description:

As described in Section 4.7.1.1, Framatome Topical Report BAW-10008, Part 1, Revision 1, [Reference 4.7-1] documents the acceptability of the reactor vessel internals under LOCA and a combination of LOCA and seismic loadings. Based on the NRC evaluation of this TLAA for 60 years, the staff concluded that the licensee has projected the neutron fluence for the reactor vessel internals using an acceptable methodology consistent with RG 1.190. Therefore, neutron fluence of the reactor vessel internals relative to the evaluation of BAW-10008, Part 1, Revision 1 is a TLAA that must be evaluated for subsequent license renewal. In addition, reactor vessel internals functionality assessment of inaccessible components (MRP-227-A/LAI #6), is identified as a TLAA for SLR.

TLAA Evaluation:

The projected 72 EFPY fluence values developed for the update of BAW-10008, Part 1, Revision 1 (Section 4.7-1) are TLAA and are obtained from Reference 4.7-20. These fluence inputs were developed based on extrapolation of 60-year reactor vessel internals transport calculations that were developed using the RG 1.190 compliant methodology (i.e., deterministic discrete ordinates transport 3-D synthesis methods) developed for the reactor vessel as described in BAW-2241PA, Revision 2, and are consistent with the fluence estimates reported in MRP-189, Revision 3 [Reference 4.7-19]. Since the BAW-2241PA, Revision 2 methodology is mainly concerned with reactor vessel fluence, some specific modeling enhancements were required in order to accurately represent the reactor vessel internals components.

In order to meet the requirements of the GALL-SLR X.M2, a reactor vessel internals fluence analysis described in Proprietary Report ANP-3899P, Revision 0 and in Non-Proprietary Report ANP-3899, Revision 0 was completed for the Oconee Nuclear Station. A single analysis was prepared to represent all three units, since they all have similar design, fabrication, operation, and fuel loading patterns. The calculation methodology included both deterministic (discrete ordinates transport) and Monte Carlo (Monte Carlo N-particle) codes [Reference 4.7-12]. The NRC clearly identified the regions of the reactor internals requiring heterogeneous, Monte Carlo monitoring during a public meeting on reactor internals fluence calculations provided on May 24, 2018 [Reference 4.7-21]. The discrete ordinates transport and Monte Carlo N-Particle results have good agreement at reactor vessel internals items that are above the irradiation degradation criteria values in MRP-175, Revision 1 [Reference 4.7-22]. In accordance with Section 4.7.1.1 above, 72 EFPY fluence/displacement per atom estimates are used to assess susceptibility to irradiation embrittlement relative to the BAW-10008, Part 1, Revision 1 TLAA evaluation for the following items.

- Baffle plates (Category 2 item)
- Plenum cover (Category 3 item)
- Plenum cylinder reinforcing plate (Category 3 item)
- Core support shield top flange (Category 3 item)

Observations of the discrete ordinates transport to Monte Carlo N-Particle comparison are as follows.

1. The discrete ordinates transport geometry is inherently limited by the R-Theta mesh. For example, straight sections in the R-Theta case (i.e., baffle plates) are modeled with a jagged edge.

2. The Monte Carlo N-Particle model of the reactor vessel internals is very detailed in the axial region of interest, with very few components homogenized. In comparison, the discrete ordinates transport model is detailed only in the axial region between the upper and lower grid, and some of those components are homogenized.

3. The Monte Carlo N-Particle model computes true 3D results directly, while the discrete ordinates transport model creates 3D results by synthesizing two 2D models (R-Theta and R-Z), which can lose accuracy outside the beltline region.

4. The Monte Carlo N-Particle model uses a continuous energy cross section set that is not subject to the parameterization of deterministic methods such as discrete ordinates transport. Because of these various limitations, the two codes have good agreement in the beltline region, but diverge in regions away from the beltline. The further from the beltline, the worse the divergence. Because of the greater fidelity of the Monte Carlo N-Particle geometry, the Monte Carlo N-Particle results are expected to be more accurate than the discrete ordinates transport results, especially in the regions far from the beltline where the divergence of the results is greatest.

5. The discrete ordinates transport and Monte Carlo N-Particle analyses used “best-estimate” input parameters. Oconee specific values were used for all of the key inputs, including the power level, axial and radial power distributions, materials, geometry, and operating history.

In addition, reactor vessel internals functionality assessment of inaccessible components (MRP-227-A/LAI #6), is identified as a TLAA for SLR. Duke Energy resolved this issue for 60 years through Framatome report ANP-3477P [Reference 4.7-23]. MRP-227-A/LAI #6 will be addressed for 80 years through the *PWR Vessel Internals* AMP (B2.1.7, GALL-SLR XI.M16A).

TLAA Disposition: 10 CFR 54.21(c)(1)(ii):

The effect of irradiation on the material properties and deformation limits of the reactor vessel internals at all three units at Oconee is acceptable for a 72 EFPY lifetime such that the internals will have adequate ductility to absorb local strain at the regions of maximum stress intensity, and that irradiation will not adversely affect deformation limits under faulted condition loadings and is reported in Section 4.7.1.1. Therefore the neutron fluence input into this TLAA has been projected to the end of the SPEO in accordance with 10 CFR 54.21(c)(1)(ii). Reactor vessel internals fluence shall be monitored for the baffle plates (Category 2 item), plenum cover (Category 3 item), plenum cylinder reinforcing plate (Category 3 item), and core support shield top flange (Category 3 item) in accordance with the ONS *Neutron Fluence Monitoring* Program (B3.2, GALL-SLR X.M2) to ensure that the TLAA reported in Section 4.7.1.1 remains valid during the SPEO.

4.7.2 REACTOR VESSEL UNDERCLAD CRACKING

TLAA Description:

Intergranular separations in the heat-affected zone of reactor vessel low-alloy steel under austenitic stainless steel cladding (i.e., underclad cracking) is a potential TLAA, as indicated in Table 4.7-1 of NUREG-2192 [Reference 4.7-24]. Duke Energy identified and evaluated this TLAA for 60-years in the Oconee LRA [Reference 4.7-13], Section 5.4.2.3, wherein reference is made to BAW-2274, which is contained in BAW-2251-A [Reference 4.7-26] as Appendix C. NRC approval of the application of BAW-2251A, Appendix C, to the ONS 60-year LRA is reported in NUREG-1723 [Reference 4.7-4] Section 4.2.4.4. Underclad cracking was recently evaluated for measurement uncertainty recapture conditions as reported in the ONS License Amendment Request [Reference 4.7-27] Section IV.1.C.vii. The measurement uncertainty recapture evaluation concluded that the generic 48 EFPY evaluation reported in BAW-2251A, Appendix C remained bounding for Oconee when considering measurement uncertainty recapture conditions at 54 EFPY.

TLAA Evaluation:

Underclad cracking refers to intergranular separations in the heat-affected zones of low alloy base metal under austenitic stainless steel cladding in SA-508, Class 2 reactor vessel forgings manufactured to a coarse grain practice, and clad by high-heat-input submerged arc processes. BAW-10013 (Reference 4.7-28) contains a fracture mechanics analysis that demonstrates the critical crack size required to initiate fast fracture is several orders of magnitude greater than the assumed maximum flaw size plus predicted flaw growth due to design fatigue cycles. The flaw growth analysis was performed for a 40-year cyclic loading, and an end-of-life assessment of radiation embrittlement (i.e., fluence at 32 EFPY) was used to determine fracture toughness properties. The report concluded that the intergranular separations found in B&W vessels would not lead to vessel failure. This report was accepted by the Atomic Energy Commission.

In May 1973, the Atomic Energy Commission issued RG 1.43, *"Control of Stainless Steel Weld Cladding of Low-Alloy Steel Components",* Revision 1*,* March 2011 [Reference 4.7-37]. The guide states that intergranular separation *"has been reported only in forgings and plate material of SA-508 Class 2 composition made to coarse grain practice when clad using high-deposition-rate welding processes identified as 'high-heat-input' processes such as the submerged-arc wide-strip and the submerged-arc 6-wire processes. Cracking was not observed in clad SA-508 Class 2 materials clad by 'low-heat-input' processes controlled to minimize heating of the base metal. Further, cracking was not observed in clad SA-533 Grade B Class 1 plate material, which is produced to fine grain practice. Characteristically, the cracking occurs only in the grain-coarsened region of the base-metal heat-affected zone at the weld bead overlap."* The guide also notes that the maximum observed dimensions of these subsurface cracks is 0.5 inch long × 0.165 inch deep.

The methodology used to evaluate intergranular separations for the ONS reactor vessels at 80 years is consistent with the methodology reported in the update of BAW-10013 included as Appendix C of BAW-2251A. An Oconee specific analysis, described in Proprietary Report ANP-3898P, Revision 0 and in Non-Proprietary Report ANP-3898P/NP Revision 0 [References 4.7-40 and 4.7-41 respectively] was performed for 72 EFPY and measurement uncertainty recapture conditions using current fracture toughness information, applied stress intensity factor solutions, fatigue crack growth correlations for SA-508 Class 2 materials, and is evaluated in accordance with the methodology prescribed in ASME Section XI, 2013 Edition, IWB-3612.

The analysis was applied to five regions of the reactor vessel: flange top, nozzle belt, shell taper, shell, and transition forging. Since the closure head for each ONS unit has been replaced, and the replacement closure head is not susceptible to UCC, the closure heads were not reevaluated [Reference 4.7-27 and 4.7-44]. Both axial and circumferential oriented flaws were considered in the evaluation. All significant normal and upset condition transients and emergency and faulted condition transients were evaluated in the analysis. The fatigue crack growth analysis considered all the normal and upset condition transients with associated design cycles (80-year design cycles are equivalent to 40- and 60-year design cycles) for the SPEO.

Semi-elliptical surface flaws (axial and circumferential) with an initial flaw size of 0.353-inch deep (approximately twice that which has been observed) and 2.12-inch long (approximately four times that which has been observed) with a 6:1 aspect ratio was conservatively assumed at each of the two regions. This is contrasted to the observed flaws which are subsurface with a maximum size of 0.165 inch deep by 0.5 inch long.

It was demonstrated that at all the investigated locations, postulated flaws in both the axial and circumferential orientations meet the acceptance criteria of Article IWB-3612 for Level A/B (normal/upset), and Level C/D (emergency/faulted) loading conditions after accounting for plastic zone correction.

The lowest fracture toughness margin for Level A/B (normal/upset) loading conditions is 3.94 and occurs at the flange top location for the axially oriented flaw, which is higher than the minimum required margin of 3.16 ($\sqrt{10}$ = 3.16). The lowest fracture toughness margin for Level C/D (emergency/faulted) loading condition is 1.62 and occurs at the shell taper region due to a circumferentially oriented flaw, which is greater than the minimum required margin of 1.41 ($\sqrt{2}$ =

1.41). Therefore, postulated flaws for the underclad cracking in the reactor vessels for all the three Oconee units remain acceptable at the end of the 72 EFPY service evaluation period.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii):

For the Oconee Units 1, 2, and 3, reactor vessel shells, including the transition forging, nozzle belt and flange, underclad cracking TLAA have been projected to the end of the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

4.7.3 REACTOR COOLANT PUMP FLYWHEEL FATIGUE ANALYSIS

TLAA Description:

The assessment phase of the ONS SLR Program identified the number of reactor coolant pump motor starts as a potential initiator for fatigue cracking in the reactor coolant pump motor flywheel bore keyway as a TLAA. Hence, this topic is considered a TLAA because the analysis meets all the criteria contained in 10 CFR 54.3.

TLAA Evaluation:

The reactor coolant pump flywheel has been designed for 10,000 loading cycles and has been identified as a TLAA for the ONS initial license renewal application. Utilizing plant data from January 1, 2000 to January 1, 2019 from the station’s operator aid computer, it was determined that, on average each reactor coolant pump is started 3 times per year. The number of reactor coolant pump starts from initial plant startup to January 1, 2000 is unknown, as is the number of future starts which is dependent upon many complex variables such as forced shutdowns, uneven starts between pumps during cooldown/startup, maintenance tests, and uncertainty across the units. To account for these deviations, it will be assumed each reactor coolant pump is started on average double what the data concludes, which yields 6 starts per year. If each flywheel conservatively experiences 6 starts per year, then at the end of the 80 years of operations, each would have roughly 480 loading cycles. Since the flywheel is designed for 10,000 starts, a safety factor of over 20 is maintained before the limitation is met.

TLAA Disposition: 10 CFR 54.21(c)(1)(ii)

The projected number of reactor coolant pump starts after 80 years of operation is 480, which is less than the manufacturers specified limitation of 10,000. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(ii) and the plant analyses has been projected to the end of SPEO.

4.7.4 LEAK BEFORE BREAK ANALYSIS FOR REACTOR COOLANT SYSTEM PIPING

TLAA Description:

The successful application of LBB to the ONS reactor coolant system main coolant piping is described in the BWOG Topical Report titled, *"The B&W Owners Group Leak-Before-Break Evaluation of Margins Against Full Break for reactor coolant system Primary Piping of B&W Designed NSSS,"* BAW-1847, Revision 1, September 1985 [Reference 4.7-29]. Duke Energy demonstrated that the LBB analyses summarized in BAW-1847, Revision 1, remains applicable and bounding to the portions of the main coolant piping that were replaced during SG replacement project. BAW-1847, Revision 1 provides the technical basis for evaluating postulated flaw growth in the main reactor coolant system piping under normal plus faulted loading conditions and was approved by the NRC for the current term of operation. The time-limited aging analyses in BAW-1847, Revision 1 includes a fatigue flaw growth evaluation and a qualitative assessment of thermal aging of cast austenitic stainless steel (CASS) for the reactor coolant inlet and outlet nozzles.

The first aspect of the LBB evaluation involves fatigue flaw growth. It is noted that the fatigue flaw growth evaluations are based on transients defined by the Oconee UFSAR Table 5-2 [Reference 4.7-30], transient cycles for reactor coolant system components except pressurizer surge line. These transients are monitored by the Oconee *Fatigue Monitoring* AMP (B3.1, GALL-SLR X.M1). The Oconee *Fatigue Monitoring* program ensures that the analyzed transient and cycles do not exceed the transients analyzed in BAW-1847, Revision 1 and provides an acceptable method for managing the fatigue flaw growth aspect of the LBB evaluation for the period of extended operation.

The second aspect of the LBB evaluation involves aging of the cast austenitic stainless steel material. Susceptibility of the reactor coolant system items fabricated from cast austenitic stainless steel to thermal aging was qualitatively assessed in BAW-1847, Revision 1. The values of the fracture toughness for aged cast austenitic stainless steel were assumed to be bounded by the ferritic piping and ferritic weldments. However, subsequent data published in NUREG/CR-6177, *"Assessment of Thermal Embrittlement of Cast Stainless Steels"* [Reference 4.7-31] indicate that prolonged exposure of cast austenitic stainless steel to reactor coolant operating temperatures can lead to reduction of fracture toughness by thermal embrittlement. Therefore, a flaw stability analysis using the lower-bound cast austenitic stainless steel fracture toughness curves from NUREG/CR-6177 was used to demonstrate the acceptability of LBB of cast austenitic stainless steel items for the reactor coolant system for the period of extended operation.

In accordance with NUREG-1723 [Reference 4.7-4], SER Related to the LR of Oconee Nuclear Station, Units 1, 2, and 3, Page 4-13, the NRC staff concluded the following.

- The *Fatigue Monitoring* program provides an acceptable method for managing the fatigue flaw growth aspect of the LBB evaluation, and

- The LBB assessment of reactor coolant system cast austenitic stainless steel materials is an acceptable TLAA for the period of extended operation.

TLAA Evaluation:

For the first aspect of the LBB evaluation involving fatigue flaw growth, projected cycles for 80 years of operation are evaluated. The 80 year projected cycles are compared to the original cycles analyzed in BAW-1847, Revision 1 to demonstrate that the original cycles analyzed are bounding and therefore the fatigue flaw growth aspect of the LBB evaluation is acceptable for the SPEO with continued monitoring using the *Fatigue Monitoring* program.

For the second aspect of the LBB evaluation, the flaw stability analysis performed using the lower bound NUREG/CR-6177 fracture toughness curves for the period of extended operation was updated to consider the most recent test data per NUREG/CR-4513, Revision 2 [Reference 4.7-32]. In addition, screening criteria is considered based on EPRI report, TR-106092, *Evaluation of Thermal Aging Embrittlement for Cast Austenitic Stainless Steel Components in LWR Reactor Coolant Systems* [Reference 4.7-33] to screen out reactor coolant pump items that are not susceptible to thermal aging embrittlement. Based on this, all Oconee Unit 1 reactor coolant pump cast austenitic stainless steel items screen out and are not susceptible to thermal aging embrittlement. Selected Oconee Unit 2 and Unit 3 cast austenitic stainless steel reactor coolant pump items screen in as susceptible to thermal embrittlement, and therefore are evaluated utilizing the most limiting heat specific fracture toughness curves per NUREG/CR-4513, Revision 2. Consequently, the flaw stability analysis using the limiting heat specific cast austenitic stainless steel fracture toughness curves per NUREG/CR-4513, Revision 2 demonstrates the acceptability of LBB for the reactor coolant pump cast austenitic stainless steel discharge and suction nozzles for SLR for 80 years of operation.

Fatigue Flaw Growth

The LBB analysis reported in BAW-1847, Revision 1, was performed in accordance with the guidance provided in Section 5.2, Item (d), of NUREG-1061, Volume 3, *"Report of the U.S. Nuclear Regulatory Commission Piping Review Committee, Evaluation of Potential for Pipe Breaks"* [Reference 4.7-34]. Specifically, a surface flaw was postulated at selected locations of the piping system (i.e., highest stress coincident with the lower bound of the material properties for base metal, weldments and safe ends), and a fatigue crack growth analysis for postulated flaws was then performed to demonstrate that the surface flaws are likely to propagate in the through-wall direction and develop leakage before they will propagate circumferentially around the pipe. Fatigue flaw growth calculations are reported in BAW-1847, Revision 1, Section 4.3, Table 4-2, and are based on the stresses and input cycles from Tables 4-3, 4-4, and 4-5 of BAW-1847, Revision 1.

The original transient cycles that were defined for 40 years of operation for reactor coolant system components are compared to the projected cycles for 80 years. The comparison indicates that none of the original 40-year transient cycles are projected to be exceeded for 80 years. Since the *Fatigue Monitoring* program will assure that projected cycles for 80 years will not exceed the original transient cycles that were defined for 40 years, the analysis summarized in BAW-1847, Revision 1 for fatigue flaw growth is still applicable for the SPEO for 80 years of plant operation.

Thermal Aging of Cast Austenitic Stainless Steel Reactor Coolant Pump Suction and Discharge Nozzles

The susceptibility of the reactor coolant system main coolant piping to thermal aging was qualitatively addressed in Section 3.3.4.3 of BAW-1847, Revision 1. As described in BAW-2243A [Reference 4.7-35], there are no reactor coolant system main coolant piping segments fabricated from cast austenitic stainless steel. However, the heat affected zone of the welded joint that connects the wrought austenitic stainless steel 28-inch pump transition piece to the cast austenitic stainless steel reactor coolant pump inlet (suction) and exit (discharge) nozzles may be susceptible to thermal embrittlement. Limited data regarding thermal aging of cast austenitic stainless steel material was available at the time of the preparation of BAW-1847, Revision 1. In the BWOG report, the values of fracture toughness for aged cast austenitic stainless steel were assumed to be bounded by the ferritic piping and ferritic weldments. Since the publication of BAW-1847, Revision 1, a significant amount of data has been obtained regarding thermal aging of cast austenitic stainless steel materials.

Test data obtained by Argonne National Laboratory [O. K. Chopra and W. J. Shack, *"Assessment of Thermal Embrittlement of Cast Stainless Steels,"* NUREG/CR-6177, U.S. Nuclear Regulatory Commission, Washington DC, May 1994 indicated that prolonged exposure of cast austenitic stainless steel to reactor coolant operating temperatures can lead to reduction of fracture toughness by thermal embrittlement. The fracture toughness curves for the ferritic base metal and ferritic weld metals used in the reactor coolant system piping LBB analysis were compared to the lower-bound fracture toughness curves of Oconee Units 1, 2 and 3 reactor coolant pump cast austenitic stainless steel materials (i.e., statically cast CF8M) from the Argonne report. The fracture toughness curve of the lower-bound cast austenitic stainless steel material is below the fracture toughness curves used in the reactor coolant system piping LBB analysis. Therefore, the assumption in BAW-1847, Revision 1, that the fracture toughness of the ferritic piping and ferritic weldments bounds the fracture toughness of cast austenitic stainless steel materials cannot be supported. Therefore, for the PEO for 60 years, a flaw stability analysis was performed using the lower-bound cast austenitic stainless steel fracture toughness curves from NUREG/CR-6177 to show acceptability of LBB.

Subsequent to this in support of SLR for 80 years of operation, the most recent fracture toughness test data from NUREG/CR-4513, Revision 2 was evaluated and determined to be limiting compared to the NUREG/CR-6177 fracture toughness data for the specific reactor coolant pump material heats evaluated. In addition, screening criteria is considered based on NUREG-2191 XI.M12 to screen out any reactor coolant pump items that are deemed not susceptible to thermal aging embrittlement. Based on this, Oconee Unit 1 reactor coolant pump components screen out and are not susceptible to thermal aging embrittlement. Oconee Units 2 and 3 do not screen out, and therefore are evaluated utilizing the most limiting heat specific fracture toughness curves per NUREG/CR-4513, Revision 2 (Reference 4.7-32). Note that the most limiting material and location used in the reactor coolant system piping LBB analysis (i.e., BAW-1847, Revision 1, Reference 4.7-29) was determined to be the base metal material of the straight section of the 28-inch cold leg pipe. Both the suction and discharge nozzles of the reactor coolant pump casings are attached to the 28-inch cold leg pipes and have similar geometry and loading applied to them as the limiting location used for the LBB analysis.

Therefore, the Oconee Units 2 and 3 discharge and suction nozzles of the reactor coolant pump casings were evaluated for LBB using heat specific fracture toughness curves per NUREG/CR-4513, Revision 2 (Reference 4.7-32). The analysis considers a bounding 10 gpm leakage crack size for the reactor coolant pump suction and discharge nozzle, which was determined using a method that is consistent with that reported in BAW-1847, Revision 1. In the revised analysis, the applied loadings were considered using the absolute sum load combination method. Therefore, in accordance with NUREG-0800, Standard Review Plan 3.6.3, Revision 1, a margin of 1.0 on load was used. The leakage crack length (twice the leakage flaw size) for the suction nozzle was determined to be 8.62 inches and the leakage crack length for the discharge nozzle was determined to be 8.86 inches. In addition, a crack extension value of 1.03 inches was considered in the flaw stability analysis for both nozzles. A flaw stability analysis was performed for the reactor coolant pump inlet (suction) and exit (discharge) nozzles. The maximum applied J value for the 10 gpm leakage flaw is 0.223 kips/in for the suction nozzle and 0.222 kips/in for the discharge nozzle. The critical flaw size was determined to be 13.54 inches for the suction nozzle and 13.76 inches for the discharge nozzle. Therefore, the margin on flaw size was determined to be 3.1 for both suction and discharge nozzles. This is greater than the required margin of 2 in accordance with SRP 3.6.3. Based on the results of this analysis, it is concluded that all the required margins for LBB per SRP 3.6.3 are met.

TLAA Disposition: 10 CFR 54.21(c)(1)(i):

The generic LBB analysis for the B&W operating plants reported in BAW-1847, Revision 1, remains valid for the SPEO in accordance with 10 CFR 54.21(c)(1)(i) for the ONS. Reduction of fracture toughness of the reactor coolant pump discharge and suction nozzles was determined to be acceptable for SPEO based on the update to the flaw stability analysis described above. Although the LBB analysis remains valid, the transient cycles will be monitored and management by the *Fatigue Monitoring* AMP (B3.1, GALL-SLR X.M1) provides additional assurance for the SPEO.

4.7.5 CRANE LOAD CYCLE LIMIT

TLAA Description:

A review of design specifications for cranes within the scope of subsequent license renewal was performed to identify those cranes that were designed or otherwise required to meet the intent of Crane Manufacturers Association of America (CMAA) Specification 70-1975, “Specifications for Electric Overhead Traveling Cranes,” and, therefore, have a defined service life as measured in load cycles. The defined service life as measured in load cycles is identified as a TLAA.

TLAA Evaluation:

CMAA Specification 70 presents the bounding combinations of the number of load cycles and mean effective load factors for each service class. These define the acceptable service limits for the TLAA. The plant response to NUREG-0612, as guided by NRC Generic Letter 81-07, *“Control of Heavy Loads,”* indicates that the cranes designed and fabricated in accordance with Electric Overhead Crane Institute (EOCI) Specification 61, “Specifications for Electric Overhead

Traveling Cranes", and compares that design approach to that of CMAA Specification 70, which has superseded EOCI Specification 61. The conclusion reached in the response to NRC Generic Letter 81-07 is that the: 1) reactor building polar cranes: 2) spent fuel pool cranes; 3) spent fuel pool auxiliary cranes; 4) pump aisle crane; 5) turbine aisle crane; 6) turbine aisle auxiliary crane; and 7) heater bay crane satisfy the design intent of CMAA Specification 70. CMAA Specification 70 provides guidance regarding fatigue but EOCI Specification 61 does not explicitly address fatigue failure. The following paragraph describes the method of selecting the service class from CMAA Specification 70 that corresponds to the service class originally specified from EOCI Specification 61. This service class is used with CMAA Specification 70, Table 2.8-1 to identify the applicable number of load cycles for that specific service class. The plant specifications for the cranes identified require design to EOCI Specification 61 Service Class A described as the following:

> *"Standby service: For such use as powerhouse, pump rooms, motor rooms, transformer repair, etc. where the crane is used very infrequently. These cranes must be substantially designed to handle expensive loads."*

The corresponding service class in CMAA Specification 70 is Class A service, which is defined as the following:

> *"Standby or Infrequent service: This service class covers cranes which may be used in installations such as powerhouses, public utilities, turbine rooms, motor rooms and transformer stations where precise handling of equipment at slow speeds with long, idle periods between lifts required. Capacity loads may be handled for initial installation of equipment and for infrequent maintenance."*

Based on the comparison of service classes described in the original design specification (EOCI Specification 61) to CMAA Specification 70, the applicable service class is Class A. CMAA Specification 70 states that a range of load cycles from 20,000 to 100,000 was considered for cranes in Class A (Standby) service thus establishing the envelope for acceptable number of load cycles for this TLAA. The total projected load cycles for the reactor building polar cranes, spent fuel pool cranes, spent fuel pool auxiliary cranes, pump aisle crane, turbine aisle crane, turbine aisle auxiliary crane, and heater bay crane based on past and future use is summarized in Table 4.7-4, Crane Load Cycles.

Table 4.7-4: Crane Load Cycles Summary

Load Handling System	CMAA Service Class	Maximum Number of Load Cycles	Projected Number of Load cycles for 80 Years	Valid for 80 Years
Unit 1 Reactor Building Polar Crane	A	100,000	1,752	Yes
Unit 2 Reactor Building Polar Crane	A	100,000	1,752	Yes
Unit 3 Reactor Building Polar Crane	A	100,000	1,752	Yes
Unit 1/2 Spent Fuel Pool Crane	A	100,000	3,316	Yes
Unit 3 Spent Fuel Pool Crane	A	100,000	2,658	Yes
Unit 1/2 Spent Fuel Auxiliary Crane	A	100,000	1,880	Yes
Unit 3 Spent Fuel Auxiliary Crane	A	100,000	940	Yes
Turbine Building Pump Isle Crane	A	100,000	3,820	Yes
Turbine Isle Crane	A	100,000	6,992	Yes
Turbine Isle Auxiliary Crane	A	100,000	6,992	Yes
Heater Bay Crane	A	100,000	3,525	Yes

Reactor Building Polar Crane Evaluation

The 185 ton reactor building polar cranes were designed to meet the intent of Class A (standby) service. The CMAA Specification 70 Class A service design includes consideration of 100,000 load cycles during the life of the crane. Recurring loads associated with the reactor containment polar cranes that are in excess of 5% of crane capacity are presented in Table 4.7-5 together with infrequent loads associated with initial construction and major maintenance. The total projected number of these load cycles is approximately 1,752 for each unit over the 80-year life of the plant. Since the total number of expected load cycles is considerably less than the maximum number of load cycles of 100,000 considered for service Class A in CMA Specification 70, the TLAA for the reactor building polar cranes remains valid.

Table 4.7-5: Evaluation of Containment Polar Crane Operation

Heavy Load Description(1)	Approximate Load Weight (Tons)(1)	Frequency	Number of Refuel Cycles(2)	Number of Lifts Over Plant Life
Shield Block	15	2/refueling cycle	47	94
Reactor Vessel Head	106.4	2/refueling cycle	47	94
Indexing Fixture	30	2/refueling cycle	47	94
Indexing Fixture	25	2/refueling cycle	47	94
Reactor Coolant Pump Motor	50	2/refueling cycle	47	376
Large equipment placement lifts – Initial construction and major equipment replacement	Varible	1,000 over plant life	Not Applicable	1,000
80-year total estimated load lifts per Unit				1,752

Note (1): Load description and weights per Reference 4.7-46.
Note (2): Through the end of 2020, ONS has had 31 refueling cycles on Unit 1, 30 refueling cycles on Unit 2, and 30 refueling cycles on Unit 3. Conservatively used 31 refueling cycles through the end of 2020 and 24 month refuel cycles projected through 80 years.

Spent Fuel Pool Crane and Spent Fuel Auxiliary Crane Evaluation

The 100 ton spent fuel pool crane and 3.5 ton spent fuel auxiliary crane were designed for Class A (standby) service. The CMAA Specification-70 Class A service design includes consideration of 100,000 load cycles during crane operation. Recurring loads associated with the shared Unit 1 and 2 spent fuel pool crane and spent fuel auxiliary crane are presented in Table 4.7-6 and 4.7-7 and include miscellaneous loads and loads identified in NUREG-1723 (only used for spent fuel pool crane). Operation of the Oconee Independent Spent Fuel Storage Installation (ISFSI) results in additional lifts by the spent fuel pool cranes near their rated lifting capacity. Extending this estimate to 80 years of operation results in an estimate that is still well below the allowed number of heavy lifts. The total projected number of these loads cycles for the Spent Fuel Pool cranes are approximately 3,316 and 2,658 respectively for the 80-year operating term of the plant. The load cycles associated with the spent fuel auxiliary cranes are significantly less. Both are significantly less than the maximum number of load cycles of 100,000 considered for service Class A in CMAA Specification-70; therefore, the TLAA for the spent fuel pool crane and the spent fuel auxiliary crane remains valid.

Table 4.7-6: Evaluation of Spent Fuel Pool Crane Operation

Heavy Load Description[(1)]	Approximate Load Weight (tons)[(1)]	Frequency	Number of Refueling Cycles[(2,3)]	Number of Lifts Over Plant Life
Dry Spent Fuel Storage Cask (Units 1 and 2)	> 100	4/refueling cycle	94	376
Miscellaneous (Units 1 and 2)	20	10/refueling cycle	94	940
Dry Spent Fuel Storage Cask (Unit 3)	> 100	4/refueling cycle	94	188
Miscellaneous (Unit 3)	20	10/refueling cycle	47	470
Estimate per NUREG-1723 at 60 years	Variable	2,000 over plant life	Not Applicable	2,000
80-year total estimated load lifts				3,316 (Unit 1/2) 2,658 (Unit 3)

Note (1): Load description and weights per Reference 4.7-46 and Reference 4.7-45 (Dry Spent Fuel Storage Cask).

Note (2): Through the end of 2020, ONS has had 31 refueling cycles on Unit 1, 30 refueling cycles on Unit 2, and 30 refueling cycles on Unit 3. Conservatively used 31 refueling cycles through the end of 2020 and 24 month refuel cycles projected through 80 years.

Note (3): Unit 1 and 2 share a spent fuel pool and crane, while Unit 3 has its own spent fuel pool and crane system.

Table 4.7-7: Evaluation of Spent Fuel Auxiliary Crane Operation

Heavy Load Description[(1)]	Approximate Load Weight (Tons)[(1)]	Frequency	Number of Refueling Cycles[(2,3)]	Number of Lifts Over Plant Life
Miscellaneous (Unit 1 and 2)	3	20/refueling cycle	94	1,880
Miscellaneous (Unit 3)	3	20/refueling cycle	47	940

Table 4.7-7: Evaluation of Spent Fuel Auxiliary Crane Operation

Heavy Load Description[1]	Approximate Load Weight (Tons)[1]	Frequency	Number of Refueling Cycles[2,3]	Number of Lifts Over Plant Life
80-year total estimated load lifts				1,880 (Unit 1/2) 940 (Unit 3)

Note (1): Load description and weights per Reference 4.7-46.

Note (2): Through the end of 2020, ONS has had 31 refueling cycles on Unit 1, 30 refueling cycles on Unit 2, and 30 refueling cycles on Unit 3. Conservatively used 31 refueling cycles through the end of 2020 and 24 month refuel cycles projected through 80 years.

Note (3): Unit 1 and 2 share a spent fuel pool and crane, while Unit 3 has its own spent fuel pool and crane system.

Turbine Building Pump Aisle Crane Evaluation

The 12 ton turbine building pump aisle crane was designed to meet the intent of Class A (standby) service. The CMAA Specification 70 Class A service design includes consideration of 100,000 load cycles during the life of the crane. Recurring loads associated with the pump aisle crane that are in excess of 5% of crane capacity are presented in Table 4.7-8 together with infrequent loads associated with initial construction and major maintenance. The total projected number of these load cycles is approximately 3,820 over the 80-year life of the plant. Since the total number of expected load cycles is considerably less than the maximum number of load cycles of 100,000 considered for Service Class A in CMAA Specification 70, the TLAA for the turbine building pump aisle crane remains valid.

Table 4.7-8: Evaluation of Turbine Building Pump Aisle Crane Operation

Heavy Load Description(1)	Approximate Load Weight (Tons)(1)	Frequency	Number of Refueling Cycles(2,3)	Number of Lifts Over Plant Life
Pump	8	10/refueling cycle	141	1,410
Miscellaneous	10	10/refueling cycle	141	1,410
Large equipment placement lifts – Initial construction and major equipment replacement	Variable	1,000 over plant life	Not Applicable	1,000
80-year total estimated load lifts				3,820

Note (1): Load description and weights per Reference 4.7-46.
Note (2): Through the end of 2020, ONS has had 31 refueling cycles on Unit 1, 30 refueling cycles on Unit 2, and 30 refueling cycles on Unit 3. Conservatively used 31 refueling cycles through the end of 2020 and 24 month refuel cycles projected through 80 years.
Note (3): There is only one Turbine Building pump aisle crane for all 3 ONS Units.

Turbine Aisle Crane Evaluation

The 180 ton turbine aisle crane was designed to meet the intent of Class A (standby) service. The CMAA Specification 70 Class A service design includes consideration of 100,000 load cycles during the life of the crane. Recurring loads associated with the turbine aisle crane that are in excess of 5% of crane capacity are presented in Table 4.7-9 together with infrequent loads associated with initial construction and major maintenance. The total projected number of these load cycles is approximately 6,922 over the 80-year life of the plant. Since the total number of expected load cycles is considerably less than the maximum number of load cycles of 100,000 considered for Service Class A in CMAA Specification 70, the TLAA for the turbine aisle crane remains valid.

Table 4.7-9: Evaluation of Turbine Aisle Crane Operation

Heavy Load Description(1)	Approximate Load Weight (Tons)(1)	Frequency	Number of Refueling Cycles(2,3)	Number of Lifts Over Plant Life
Generator	183	2/refueling cycle	141	282
Low Pressure Rotor	120	8/refueling cycle	141	1,128
Diaphrams	4	8/refueling cycle	141	1,128
3,384Bearings	2	24/refueling cycle	141	3,384
Large equipment placement lifts – Initial construction and major equipment replacement	Variable	1,000 over plant life	Not Applicable	1,000
80-year total estimated load lifts				6,922

Note (1): Load description and weights per Reference 4.7-46.
Note (2): Through the end of 2020, ONS has had 31 refueling cycles on Unit 1, 30 refueling cycles on Unit 2, and 30 refueling cycles on Unit 3. Conservatively used 31 refueling cycles through the end of 2020 and 24 month refuel cycles projected through 80 years.
Note (3): There is only one Turbine aisle crane for all 3 ONS Units.

Turbine Aisle Auxiliary Crane Evaluation

The 25 ton turbine aisle auxiliary crane was designed to meet the intent of Class A (standby) service. The CMAA Specification 70 Class A service design includes consideration of 100,000 load cycles during the life of the crane. Recurring loads associated with the turbine aisle auxiliary crane that are in excess of 5% of crane capacity are presented in Table 4.7-10 together with infrequent loads associated with initial construction and major maintenance. The total projected number of these load cycles is approximately 6,922 over the 80-year life of the plant. Since the total number of expected load cycles is considerably less than the maximum number of load cycles of 100,000 considered for Service Class A in CMAA Specification 70, the TLAA for the turbine aisle auxiliary crane remains valid.

Table 4.7-10: Evaluation of Turbine Aisle Auxiliary Crane Operation

Heavy Load Description[(1)]	Approximate Load Weight (Tons)[(1)]	Frequency	Number of Refueling Cycles[(2,3)]	Number of Lifts Over Plant Life
Diaphrams	4	8/refueling cycle	141	1,128
Bearings	2	24/refueling cycle	141	3,384
Miscellaneous	10	10/refueling cycle	141	1,410
Large equipment placement lifts – Initial construction and major equipment replacement	Variable	1,000 over plant life	Not Applicable	1,000
80-year total estimated load lifts				6,922

Note (1): Load description and weights per Reference 4.7-46.
Note (2): Through the end of 2020, ONS has had 31 refueling cycles on Unit 1, 30 refueling cycles on Unit 2, and 30 refueling cycles on Unit 3. Conservatively used 31 refueling cycles through the end of 2020 and 24 month refuel cycles projected through 80 years.
Note (3): There is only one Turbine aisle auxiliary crane for all 3 ONS Units.

Heater Bay Crane Evaluation:

The 80 ton heater bay crane was designed to meet the intent of Class A (standby) service. The CMAA Specification 70 Class A service design includes consideration of 100,000 load cycles during the life of the crane. Recurring loads associated with the heater bay crane that are in excess of 5% of crane capacity are presented in Table 4.7-11 together with infrequent loads associated with initial construction and major maintenance. The total projected number of these load cycles is approximately 3,525 over the 80-year life of the plant. Since the total number of expected load cycles is considerably less than the maximum number of load cycles of 100,000 considered for Service Class A in CMAA Specification 70, the TLAA for the heater bay crane remains valid.

Table 4.7-11: Evaluation of Heater Bay Crane Operation

Heavy Load Description(1)	Approximate Load Weight (Tons)(1)	Frequency	Number of Refueling Cycles(2,3)	Number of Lifts Over Plant Life
Feedwater Heater Shell	20	10/refueling cycle	141	1,410
Pumps	13	5/refueling cycle	141	705
Miscellaneous	10	10/refueling cycle	141	1,410
80-year total estimated load lifts				3,525

Note (1): Load description and weights per Reference 4.7-46.
Note (2): Through the end of 2020, ONS has had 31 refueling cycles on Unit 1, 30 refueling cycles on Unit 2, and 30 refueling cycles on Unit 3. Conservatively used 31 refueling cycles through the end of 2020 and 24 month refuel cycles projected through 80 years.
Note (3): There is only one heater bay crane for all 3 ONS Units.

TLAA Disposition: 10 CFR 54.21(c)(1)(i):

The load cycle evaluation for the cranes identified in Table 4.7-4 have been demonstrated to remain valid through the subsequent period of extended operation in accordance with the requirements of 10 CFR 54.21(c)(1)(i).

4.7.6 REFERENCES

4.7-1 BAW-10008, Part 1, Revision 1, “Reactor Internals Stress and Deflection Due to Loss-of-Coolant Accident and Maximum Hypothetical Earthquake,” June 1970, ADAMS Accession Number ML19312B713 (Duke Letter) and ADAMS Accession Number ML19319B162 (NRC Letter)

4.7-2 BAW-2248A, “Demonstration of the Management of Aging Effects for the Reactor Vessel Internals,” March 2000, ADAMS Accession Number ML003708443

4.7-3 Duke Energy Letter (M. S. Tuckman) to NRC Document Control Desk License Renewal, Response to NRC Letter dated November 18, 1999, Oconee Nuclear Station, Docket Numbers 50-269, 50-270, and 50-287, December 17, 1999, ADAMS Accession Number ML993620451

4.7-4 NUREG-1723, Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3, Docket Numbers 50-269, 50-270, and 50-287, March 2000, ADAMS Accession Number ML003695154

4.7-5 Duke Energy Letter (T. Preston Gillespie) to NRC Document Control Desk, Duke Energy Carolinas, LLC, Oconee Nuclear Station (ONS), Units 1, 2, and 3, Docket Numbers 50-269, 50-270, and 50-287, License Renewal Commitment to Submit a Time Limited Aging Analysis for the Reactor Vessel Internals to the NRC for Review, February 20, 2012, ADAMS Accession Number ML12053A332

4.7-6 NRC Letter (John Boska) to Duke Energy (Preston Gillespie), Oconee Nuclear Station, Units 1, 2, and 3 – Approval of Time-Limited Aging Analysis for Reactor Vessel Internals, February 19, 2013, ADAMS Accession Number ML13045A489

4.7-7 FENOC Letter (Brian D. Boles) to NRC Document Control Desk, Davis-Besse Nuclear Power Station, Unit No. 1 Docket No. 50-346, License Number NPF-3, MRP-227-A Applicant Action Item 8: Time-Limited Aging Analysis (TLAA) Regarding Reactor Vessel Internals Loss of Ductility at 60 Years (ANP-3542P/NP, Revision 1 Attached), January 23, 2017, ADAMS Accession Number ML17026A007

4.7-8 NRC Letter (Blake Purnell) to FENOC (Mark B. Bezilla), “Davis-Besse Nuclear Power Station, Unit No. 1 - Time-Limited Aging Analysis for the Reactor Vessel Internals Loss of Ductility at 60 Years, October 12, 2017, NRC Accession Number ML17256B190

4.7-9 BAW-1621, B&W 177-FA Owners Group – Effects of Asymmetric LOCA Loadings – Phase II Analysis, July 1980, ADAMS Accession Number 19320B058

4.7-10 BAW-1621, Supplement 1 (77-1126594-00), “B&W 177-FA Owners Group – Effects of Asymmetric LOCA Loadings – Phase II Analysis – Supplement 1 Responses to NRC Questions,” June 1981, ADAMS Accession Number ML20009B628

4.7-11 NRC Letter (John F. Stolz) to Duke Energy (H. B. Tucker), Safety Evaluation Report on Asymmetric LOCA Loads, Oconee 1, 2, and 3, May 20, 1983, ADAMS Accession Number. ML15238A802 and ML15238A804

4.7-12 ANP-3899P, Revision 0, Framatome Reactor Vessel Internals TLAA Input to the ONS SLRA, May 2021

4.7-13 Duke Power Letter (Mike S. Tuckman) to NRC Document Control Desk, Application for Renewed Operating licenses, Oconee Nuclear Station, Unit Nos. 1, 2, and 3, July 6, 1998, ADAMS Accession Numbers ML15112A661 and ML15254A151

4.7-14 Not Used

4.7-15 NUREG/CR-6909, Revision 1, "Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials," May 2018.

4.7-16 ANP 3899NP, Revision 0, Framatome Reactor Vessel Internals TLAA Input to the ONS SLRA, May 2021

4.7-17 BAW-10051, Revision 1, "Design of Reactor Internals and Incore Instrumentation Nozzles for Flow Induced Vibration," September 1972, revised in November 1972. Acceptability of BAW-10051, Revision 1. ADAMS Accession No. 19316A566

4.7-18 BAW-10051A, Supplement 1, "Structural Analysis of 177-FA Redesigned Surveillance Specimen Holder Tube" August 1976, reprinted in June 1979. ADAMS Accession No. ML19248D133, 7908020516 (legacy)

4.7-19 Framatome Document 47-9009370-004, Part Materials Reliability Program: Screening, Categorization, and Ranking of B&W Designed PWR Internals Component Items. Submitted to the NRC by EPRI—"Transmit Electric Power Research Institute Topical Report MRP-189 Rev.3 to NRC for Information", ADAMS Accession Number ML20091K286

4.7-20 BAW-2241NP-A, Revision 2, "Fluence and Uncertainty Methodologies" ADAMS Accession No. ML073310655 (Proprietary) ML073310660 (Non-Proprietary)

4.7-21 Summary of NRC Fluence Computational Methodology Public Meeting, Jay Wallace, et al, NRC, May 2018, ADAMS Accession Number ML18159A004

4.7-22 Materials Reliability Program: PWR Internals Material Aging Degradation Mechanism Screening and Threshold Values (MRP-175, Revision 1). EPRI, Palo Alto, CA: 2017. 3002010268, ADAMS Accession Number ML15358A046 and ADAMS Accession Number ML17361A187

4.7-23 ANP-3477P/NP, Revision 0, Oconee Nuclear Station Units 1, 2, and 3, "MRP-227-A Applicant/Licensee Action Item 6 Analysis", ADAMS Accession No. ML16152A051 (Duke Energy Submittal letter) and ML16152A052

4.7-24 NUREG-2192, Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants

4.7-25 Not Used

4.7-26 Framatome Document 43-2251A, Demonstration of Management of Aging Effects for the Reactor Vessel, Generic License Renewal Program, (BAW-2251A, Revision 2), August 1999, ADAMS Accession Number ML20212G901

4.7-27 Oconee Nuclear Station, Units 1, 2 and 3, License Amendment Request for Measurement Uncertainty Recapture Power Uprate, February 19, 2020, ADAMS accession number ML20050D379

4.7-28 BAW-10013, Study of Intergranular Separations in Low-Alloy, Steel Heat-Affected Zones Under Austenitic Stainless Steel Weld Cladding. December 1971, ADAMS Accession Number ML1931G636, ADAMS Accession Number ML19317G636 (NRC Evaluation)

4.7-29 BAW-1847, “The B&W Owners Group Leak-Before-Break Evaluation of Margins Against Full Break for RCS Primary Piping of B&W Designed NSSS,” Revision 1, B&W Owners Group, September 1985. ADAMS Accession Number ML20138R230.

4.7-30 Oconee Nuclear Station, UFSAR, Revision 28, Table 5-2

4.7-31 NUREG/CR-6177, “Assessment of Thermal Embrittlement of Cast Stainless Steels”. May 1994

4.7-32 NUREG/CR-4513, Revision 2, “Estimation of Fracture Toughness of Cast Stainless Steels during Thermal Aging in LWR Systems,” May 2016

4.7-33 EPRI Report EPRI TR-106092, Evaluation of Thermal Aging Embrittlement for Cast Austenitic Stainless Steel Components in LWR Reactor Coolant Systems, September 1997, ADAMS accession number ML003727111

4.7-34 NUREG-1061, Volume 3, “Report of the U.S. Nuclear Regulatory Commission Piping Review Committee, Evaluation of Potential for Pipe Breaks.

4.7-35 BAW-2243A, “Demonstration of the Management of Aging Effects for the Reactor Coolant System Piping,” The B&W Owners Group Generic License Renewal Program, June 1996, ADAMS Accession Number ML20113A993

4.7-36 Not Used

4.7-37 Regulatory Guide 1.43, Control of Stainless Steel Weld Cladding of Low-Alloy Steel Components, Revision 1, March 2011

4.7-38 ONS UFSAR, Revision 28, Section 3.12, Cranes and Control of Heavy Loads

4.7-39 ONS UFSAR, Revision 28 Section 18.3.5, Crane Inspection Program

4.7-40 ANP-3898P, Revision 0, Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA, May 2021

4.7-41 ANP-3898NP, Revision 0, Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA, May 2021

4.7-42 ONS UFSAR, Revision 28, Section 9.1.5, Overhead Heavy-Load Handling Systems

4.7-43 Crane Manufacturers Association of America Specification 70-1975

4.7-44 Oconee Nuclear Station, Units 1, 2 & 3, NRC issuance of Amendment Numbers 420, 422 and 421 Measurement Uncertainty Recapture Power Uprate, dated January 26, 2021, ADAMS Accession Number ML20335A00

4.7-45 NUHOMS UFSAR For The Standardized NUHOMS Horizontal Modular Storage System for Irradiated Nuclear Fuel, Revision 13, January 2013

4.7-46 NRC Letter (John F Stolz) to Duke Power (Hal B. Tucker), Oconee Nuclear Station, Units 1, 2, and 3, Safety Evaluation Report on Phase 1 Control of Heavy Loads, April 20, 1993, ADAMS Accession Numbers ML15238A795 and ML15238A797

A UFSAR SUPPLEMENT

Oconee Nuclear Station

Units 1, 2, and 3

Application for Subsequent License Renewal

Appendix A

UFSAR Supplement

A1.0 INTRODUCTION

This appendix provides the information to be submitted in a Supplement to the UFSAR as required by 10 CFR 54.21(d) for the ONS, Units 1, 2, and 3, SLRA. Section 4.0 of the SLRA documents the evaluations of TLAAs for the SPEO. Appendix B of the SLRA provides descriptions of the programs and activities that manage the effects of aging for the SPEO. The information in Section 4.0 and Appendix B was used to prepare this appendix.

This appendix, which comprises the UFSAR supplement, includes the following sections:

- Section A2.0 contains summary descriptions of the AMPs used to manage the effects of aging during the SPEO. The AMPs are either consistent with generally accepted industry methods as discussed in NUREG-2191 Chapter XI programs or require enhancements. Commitments for program additions and enhancements are identified in Section A6.0, SLR Commitments.
- Section A3.0 contains summary descriptions of AMPs used for management of TLAAs during the SPEO. The AMPs are either consistent with generally accepted industry methods as discussed in NUREG-2191 Chapter X programs associated with TLAAs or require enhancements. Commitments for program additions and enhancements are identified in Section A6.0, SLR commitments.
- Section A4.0 contains evaluation summaries of TLAAs applicable to the SPEO.
- Section A5.0 contains a summary description of a plant-specific AMP for managing the effects of aging during the SPEO. Commitments for the program additions and enhancements are identified in Section A6.0, SLR commitments
- Section A6.0 contains summary descriptions of SLR commitments. Table A6.0-1, SLR Commitments, includes the commitments for SLR along with an associated schedule indicating when Duke Energy plans to complete each commitment.

Following issuance of the subsequent renewal operating licenses, information in Appendix A will be incorporated in the LR section of the UFSAR, Chapter 18. This is consistent with the requirements of 10 CFR 50.71(e). Upon inclusion in the UFSAR, future changes to the information in UFSAR Chapter 18 will be made under the provisions of 10 CFR 50.59.

The results of the integrated plant assessment and evaluation of TLAAs identified existing and new AMPs necessary to provide reasonable assurance that components within the scope of LR will continue to perform their intended functions consistent with the CLB for the SPEO. The SPEO is defined as 20 years from the current renewed operating license expiration date. In addition, a discussion on quality assurance and OE related to AMPs is provided in this section.

Quality Assurance for Aging Management Programs

The Quality Assurance (QA) Program is described in Topical Report DUKE-QAPD-001-A, “Quality Assurance Program Description, Operating Fleet” which implements the requirements of 10 CFR 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.” The QA Program is consistent with the summary in Appendix A.2, “Quality Assurance for AMPs (Branch Technical Position IQMB-1)” of NUREG-2192. The QA Program provides the basis for the corrective actions, confirmation process, and administrative controls elements of AMPs. The scope of the existing QA Program is expanded to include non-safety related structures and components that are subject to an AMR for LR. The QA Program is applicable to the safety related and non-safety related structures, components, and commodity groups that are subject to AMR.

Consideration of Operating Experience in Aging Management Programs

OE from plant-specific and industry sources is captured and systematically reviewed on an ongoing basis in accordance with the QA Program, which meets the requirements of 10 CFR 50, Appendix B, and the OE program, which meets the requirements of NUREG-0737, “Clarification of TMI Action Plan Requirements,” Item I.C.5, “Procedures for Feedback of OE to Plant Staff.”

The Duke Energy OE program interfaces with and relies on active participation in the INPO OE program, as endorsed by the NRC. In accordance with these programs, all incoming OE items are screened to determine whether they may involve age-related degradation or aging management impacts. Research and development is also reviewed. Items so identified are further evaluated and the AMPs are either enhanced or new AMPs are developed, as appropriate, when it is determined through these evaluations that the effects of aging may not be adequately managed. Training on age-related degradation and aging management is provided to those personnel responsible for implementing the AMPs and to those who may submit, screen, assign, evaluate, or otherwise process plant-specific and industry OE. Plant-specific OE associated with aging management and age-related degradation is reported to the industry in accordance with guidelines established in the Duke Energy OE program.

A2.0 SUMMARY DESCRIPTIONS OF AGING MANAGEMENT PROGRAMS

The NUREG-2191 Chapter XI AMPs are described in the following sections. The AMPs are either consistent with generally accepted industry methods as discussed in NUREG-2191 or require enhancements. The following list reflects the status of these programs at the time of the SLRA submittal. Commitments for program additions and enhancements are identified in the Appendix A6.0 Subsequent License Renewal Commitment List.

A2.1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

Program Description

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP is an existing condition monitoring program that manages the aging effects of cracking, loss of fracture toughness, and loss of material. The program consists of periodic volumetric, surface, and/or visual examinations and leakage tests of ASME Class 1, 2, and 3 pressure retaining components, including welds, pump casings, valve bodies, integral attachments, and pressure retaining bolting. The program includes assessment, identification of signs of degradation and establishment of corrective actions.

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP is implemented in accordance with 10 CFR 50.55a and ASME Code, Section XI, Subsections IWB, IWC, and IWD. The ASME Code, Section XI, edition and addenda used will be consistent with the provisions of 10 CFR 50.55a during the SPEO. The program includes augmented inservice inspection (ISI) requirements and examinations associated with the ASME Code, Section XI, ISI program. These additional inspections are identified in the ONS Augmented ISI program and are included in the ISI schedule.

Enhancements

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP will be enhanced to:

1. Revise procedures to require inspections to be performed for components associated with sentinel locations assessed under ASME Code, Section XI, Non-Mandatory Appendix L for the following:

    - Reactor coolant system pressurizer surge line piping (hot leg elbow).
    - High pressure injection piping, stop valve-to-check valve (usage bounds high pressure injection nozzle).

A2.2 Water Chemistry

Program Description

The *Water Chemistry* AMP is an existing program that mitigates aging effects of loss of material due to corrosion, cracking due to stress corrosion cracking, and related mechanisms, and reduction of heat transfer due to fouling in components exposed to a reactor coolant, steam, treated borated water, treated water, or secondary feedwater environment. Chemistry programs are used to control water chemistry for parameters such as conductivity, chloride, fluoride, and sulfate that accelerate corrosion.

The *Water Chemistry* AMP relies on monitoring and control of water chemistry to keep peak levels of various contaminants below the system-specific limits, based on EPRI Report 3002000505, Revision 7, *Pressurized Water Reactor Primary Water Chemistry Guidelines* and EPRI Report 3002010645, Revision 8, *Pressurized Water Reactor Secondary Water Chemistry Guidelines*.

Enhancements

None

A2.3 Reactor Head Closure Stud Bolting

Program Description

The *Reactor Head Closure Stud Bolting* AMP is an existing condition monitoring and preventive program that manages cracking and loss of material for the reactor head closure stud assembly (which includes the closure studs, nuts, and washers) and for the threads in the reactor vessel flange.

The *Reactor Head Closure Stud Bolting* AMP is implemented through station procedures based on the examination requirements specified in the *ASME Code, Section XI, Subsection IWB, Table IWB-2500-1* and preventive measures to mitigate cracking as delineated in RG 1.65, Revision 1, with the exception that existing stud bolting components have a measured yield strength greater than or equal to 150 ksi and an ultimate tensile stress greater than or equal to 170 ksi. In addition, potential replacement stud bolting components in the warehouse may have measured yield strength greater than or equal to 150 ksi.

Enhancements

The *Reactor Head Closure Stud Bolting* AMP will be enhanced to:

1. Revise procurement requirements for reactor head closure stud bolting to incorporate guidance from RG 1.65, Revision 1 and NUREG-2191, Chapter XI.M3, to ensure newly procured bolting material does not exceed the limit for maximum measured yield strength of 150 ksi and ultimate tensile strength of 170 ksi.

A2.4 Boric Acid Corrosion

Program Description

The *Boric Acid Corrosion* AMP is an existing condition monitoring program that manages loss of material due to leaking borated water on structures and components, including electrical equipment/junction boxes. This program relies, in part, on the response to NRC GL 88-05, "*Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants,*" to identify, evaluate, and correct borated water leaks that could cause corrosion damage to reactor coolant pressure boundary components.

The program also includes inspections, evaluations, and corrective actions for components subject to AMR that may be adversely affected by some form of borated water leakage. This program includes provisions to initiate evaluations and assessments when leakage is discovered by activities not associated with the program. This program further follows the guidance described in Section 7 of WCAP-15988-NP, Revision 2, *Generic Guidance for an Effective Boric Acid Inspection Program for Pressurized Water Reactors*.

Enhancements

None

A2.5 Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components

Program Description

The *Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components* AMP is an existing condition monitoring program that addresses OE of degradation due to primary water stress corrosion cracking for components or welds constructed from Alloy 600/82/182 and exposed to pressurized water reactor primary coolant at elevated temperatures.

The scope of the program includes the following groups of components and materials:

a. Nickel alloy components and welds identified in the industry guidance document "*Materials Reliability Program: Generic Guidance for Alloy 600 Management*" (EPRI MRP-126).

b. Nickel alloy components and welds identified in ASME Code Cases N-770, N-729 and N-722, as incorporated by reference in 10 CFR 50.55a.

c. Alloy 600 full penetration branch connection weld metal buildup for material susceptible to primary water stress corrosion cracking in accordance with ASME Code Case N-853.

d. Components that are susceptible to corrosion by borated water leakage and may be impacted by leakage of borated water from nearby or adjacent nickel alloy components previously described.

Examinations are conducted in accordance with 10 CFR 50.55a and EPRI MRP-126 for nickel-alloy components and welds identified in EPRI MRP-126 and addressed by 10 CFR 50.55a.

The *Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components* AMP is used in conjunction with the *Water Chemistry* AMP (A2.2) because water chemistry can affect the cracking of nickel alloys.

<u>Enhancements</u>

None

A2.6 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)

<u>Program Description</u>

The *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel* (CASS) AMP is a new condition monitoring program that will provide assurance that specific reactor coolant pressure boundary cast austenitic stainless steel components with the potential for thermal aging embrittlement meet their intended functions. The specific reactor coolant system (Class 1) pressure boundary components consist of those made from CASS with service conditions above 250°C (482°F), including valve bodies and pump casings and covers. Oconee does not have Class 1 piping or fittings fabricated from CASS.

For applicable Class 1 CASS valve bodies, the existing ASME Code, Section XI inspection requirements are adequate to manage thermal aging embrittlement. The Section XI inspection requirements are implemented at Oconee through the ONS *ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD* AMP.

For Class 1 CASS reactor coolant pump casings and covers with service conditions above 250°C (482°F), a screening for significance is performed as a first step to determine if thermal aging embrittlement is a potentially significant aging effect. This screening considers casting method, molybdenum content, and percent ferrite in each casting.

For reactor coolant pump casings and covers found to be potentially susceptible to thermal aging embrittlement, a bounding flaw tolerance evaluation was performed. The result demonstrates adequate fracture toughness to address thermal aging embrittlement. The successful result also means that no additional inspections or evaluations will be required to address thermal aging embrittlement for the SPEO.

Industry and plant-specific OE will be considered in the development and implementation of this program.

Enhancements

None

A2.7 PWR Vessel Internals

Program Description

The *PWR Vessel Internals* AMP is an existing condition monitoring program that relies on the implementation of the inspection and evaluation guidelines in Electric Power Research Institute (EPRI) Materials Reliability Program (MRP) Report No. 1022863, "Materials Reliability Program: Pressurized Water Reactor (PWR) Internals Inspection and Evaluation Guidelines," MRP-227-A, inspection standard for PWR Internals in MRP-228, and the ONS gap analysis (B2.1.7) that identifies enhancements to the program that are needed to address an 80-year operating period. This program is used to manage: (a) cracking due to stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking, and cracking due to fatigue/cyclical loading; (b) loss of material due to wear; (c) loss of fracture toughness due to either thermal aging, neutron irradiation embrittlement, or void swelling; (d) dimensional changes due to void swelling or distortion; and (e) loss of preload due to thermal and irradiation-enhanced stress relaxation or creep.

The *PWR Vessel Internals* AMP includes the reactor internals components identified within MRP-227-A for Oconee, and the ONS gap analysis, which is based on MRP-227, Revision 1-A. The completed gap analysis incorporates screening, categorizing, and ranking results from MRP-189, Revision 3, and engineering evaluation and assessment of age-related degradation from MRP-229, to identify revisions and/or additional inspections not listed in MRP-227, Revision 1-A.

The scope of components considered for inspection includes core support structures, those reactor vessel internals components that serve an intended LR safety function pursuant to criteria in 10 CFR 54.4(a)(1), and other reactor vessel internals components whose failure could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1)(i), (ii), or (iii). ASME Code, Section XI also includes inspection requirements for PWR removable core support structures in Table IWB-2500-1, Examination Category B-N-3, which are in addition to any inspections that are implemented in accordance with MRP-227, Revision 1-A.

The program establishes acceptance criteria for any visual, volumetric, surface, or physical measurement monitoring methods that are credited for aging management of specific reactor vessel internals components. Any detected conditions that do not satisfy the examination acceptance criteria are required to be dispositioned through the plant corrective action program, which may require repair, replacement, or analytical evaluation for continued service until the next inspection. The disposition will ensure that design basis functions of the reactor internals components will continue to be fulfilled for all licensing basis loads and events. Engineering evaluations used to disposition an examination result that does not meet the examination acceptance criteria will be conducted in accordance with NRC approved evaluation methods.

Enhancements

The following enhancement(s) will be implemented:

1. The *PWR Vessel Internals* AMP will be updated as necessary to provide guidance for implementing the changes to primary and expansion items in MRP-227, Rev 1-A, Tables 4-1, 4-4 (and Table 5-1 for Element 6 only), as modified by the ONS gap analysis reported in Appendix B2.1.7. (Elements 4 and 6)

A2.8 Flow-Accelerated Corrosion

Program Description

The *Flow-Accelerated Corrosion* AMP is an existing condition monitoring program that manages wall thinning caused by flow-accelerated corrosion. The program is based on commitments made in response to NRC GL 89-08, *"Erosion/Corrosion-Induced Pipe Wall Thinning,"* and relies on implementation of the EPRI guidelines in the Nuclear Safety Analysis Center (NSAC)-202L, Revision 4 for an effective flow-accelerated corrosion program.

CHECWORKS™ is used to predict component wear rates and remaining service life in the systems susceptible to flow-accelerated corrosion which provides reasonable assurance that structural integrity will be maintained between inspections. The CHECWORKS™ model is evaluated and updated as required to reflect any significant changes in plant operating parameters such as power uprates to ensure continued accurate modeling and wear rate prediction. This improves the predictive capability of the model to ensure that intended functions are maintained.

The program also manages wall thinning caused by mechanisms other than flow-accelerated corrosion in situations where periodic monitoring is used in lieu of eliminating the cause of various erosion mechanisms.

The program includes: (a) identifying all susceptible piping systems and components; (b) developing flow-accelerated corrosion predictive models to reflect component geometries, materials, and operating parameters; (c) performing analysis of flow-accelerated corrosion models and, with consideration of OE, selecting a sample of components for inspections; (d) inspecting components; (e) evaluating inspection data against acceptance criteria to determine the need for corrective actions including inspection sample expansion, repairs, or replacements, and to schedule future inspections; and (f) incorporating inspection data to refine flow-accelerated corrosion models.

Enhancement

The *Flow-Accelerated Corrosion* AMP will be enhanced to:

1. Reassess infrequently used piping systems excluded from the scope of the program to ensure adequate bases exist to justify this exclusion for the SPEO.

A2.9 Bolting Integrity

Program Description

The *Bolting Integrity* AMP is an existing condition monitoring program. The program manages loss of preload, cracking, and loss of material of safety related and non-safety related closure bolting on pressure-retaining components. The program utilizes recommendations and guidelines delineated in NUREG-1339, EPRI NP-5769, TR-1015336, and TR-1015337 for material selection, use of approved lubricants, proper torqueing, and leakage evaluations which are implemented during plant surveillance and maintenance activities.

The program includes periodic visual inspections of closure bolting on pressure-retaining components for indication of loss of preload, cracking, and loss of material as evidenced by pressure-retaining joint leakage. Closure bolting on pressure-retaining components and mechanical bolting that are submerged or closure bolting on pressure-retaining components located in piping systems that contain air or gas is inspected by alternative means, such as by sample based periodic inspections. The program also includes preventive measures provided in the EPRI guidance documents to preclude or minimize loss of preload and cracking.

High Strength closure bolting greater than 2 inches in diameter (regardless of code classification) with yield strength greater than or equal to 150 ksi (1,034 MPa) will be visually inspected for aging affects and inspected volumetrically in accordance with ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1.

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* (A2.1) program includes inspection of safety related closure bolting on pressure-retaining components and supplements this program. Inspection activities for bolting in a buried environment or underground with restricted access are performed in conjunction with buried piping and component inspections performed as part of the *Buried and Underground Piping and Tanks* (A2.26) program.

The *Reactor Head Closure Stud Bolting* (A2.3) program manages the aging effects of the bolting components for the reactor vessel closure head. The *ASME Section XI, Subsection IWE* (A2.28) program, *ASME Section XI, Subsection IWF* (A2.30) program, *Structures Monitoring* (A2.33) program, *Inspection of Water-Control Structures Associated with Nuclear Power Plants* (A2.34) program, and *Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* (A2.13) program manage the aging effects of safety related and non-safety related structural bolting. The *External Surfaces Monitoring of Mechanical Components* (A2.23) program manages the aging effects of safety related and non-safety related bolting associated with ductwork for heating, ventilation, and air conditioning systems.

Enhancements

The *Bolting Integrity* AMP will be enhanced to:

1. Revise applicable procedures and specifications to include reference to EPRI Report 1015336, EPRI Report 1015337, and NUREG-1339, as appropriate.

2. Revise procedures governing the direct visual examination of bolted joints to include inspection parameters such as lighting, distance, and offset.

3. Perform volumetric inspections of non-ASME high strength bolting greater than 2 inches in diameter in accordance with the method described in ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1.

4. Perform visual inspections of a representative sample of 20 percent of closure bolting where leakage is difficult to detect such as submerged connections or systems containing air/gas or a maximum of 17 bolts for each material and environment population per unit, whichever is less, during each ten year period. If the minimum sample size is not achieved during a ten year period, then alternative inspections may be performed. For submerged bolting, alternative inspections may include (a) diver inspections or (b) remote video inspections. For systems containing air/gas, alternative inspections may include (a) visual inspection for discoloration when leakage from inside the piping system would discolor the external surfaces of the component; (b) monitoring and trending of pressure decay when the bolted connection is located within an isolated boundary; (c) soap bubble testing on the external mating surface of the bolted component; or (d) thermography, when the temperature of the process fluid is higher than ambient conditions around the component.

5. Perform additional inspections of a minimum of 20% of similar bolting or five additional inspections, whichever is less, when sample based inspections do not meet acceptance criteria. If the additional inspections identify bolting that does not meet acceptance criteria, then an extent of condition and extent of cause analysis will be conducted to determine the further extent of inspections. Additional inspections of similar bolting will be performed at all three units and will occur within the same interval in which the original inspection was conducted. The corrective action program will be used to determine if changes to inspection frequency is appropriate if any inspection results indicate that loss of function will occur prior to the next scheduled inspection.

A2.10 Steam Generators

Program Description

The *Steam Generators* AMP is an existing condition monitoring program that manages the aging effects of cracking, loss of material (e.g., wall thinning), and reduction of heat transfer for the steam generators. The scope of the program includes primary-side components (e.g., tubes, plugs, lower/upper heads, tubesheet, etc.), and secondary-side components that are contained within the steam generator. The program performs volumetric inspections for the tubes, and visual inspections for the other primary-side and secondary-side components. The visual inspections of steam generator components in the scope of this AMP are performed in accordance with the degradation assessment that is prepared as each steam generator is scheduled for examination.

Provisions in the *Steam Generators* program address reporting criteria, inspection scope and frequency, assessments, plugging criteria, and water chemistry monitoring to maintain consistency with established requirements. NEI 97-06, *"Steam Generator Program Guidelines,"* and associated EPRI guidelines, provide a generic industry program to implement Oconee technical specifications related to steam generators.

In accordance with technical specification requirements, tubing and primary-side inspections are performed at least every 72 effective full power months or every third refueling outage, whichever results in more frequent inspections. Degradation assessments are performed prior to each in-service inspection, which include a review of applicable industry and plant-specific OE which has occurred since the previous degradation assessment was performed. The degradation assessment review determines the existence of any unaddressed mechanism that could adversely affect steam generator primary-side or secondary-side integrity, as well as the effects of any chemistry excursions or transients that could affect existing degradation mechanisms.

The *Steam Generators* program includes preventive measures to mitigate aging related to corrosion phenomena, and through foreign material exclusion to inhibit tube degradation due to wear. Identification of deposits on the secondary side of the steam generator, and the subsequent removal of sludge deposits help avoid tube degradation.

The Oconee technical specifications require condition monitoring assessments to verify structural and leakage integrity after steam generator inspections have been completed. Operational assessments are also required by NEI 97-06 to ensure tube integrity will be maintained until the next inspection.

<u>Enhancements</u>

None

A2.11 Open-Cycle Cooling Water System

<u>Program Description</u>

The *Open-Cycle Cooling Water System* AMP is an existing preventive, mitigative, condition monitoring, and performance monitoring program based on the implementation of NRC GL 89-13, and includes non-safety related portions of the open-cycle cooling water system. The program includes: (a) surveillance and control to significantly reduce the incidence of flow blockage problems as a result of biofouling, (b) tests to verify heat transfer of heat exchangers, (c) periodic inspection and maintenance so that corrosion, erosion, cracking, fouling, and biofouling cannot degrade the performance of systems serviced by the open-cycle cooling water system. This program includes guidance beyond the requirements contained in NRC GL 89-13, such as inputs from industry reports and documents (e.g., EPRI documents) that address OE such that aging effects are adequately managed. The program also manages loss of coating integrity for certain components that do not perform a pressure boundary intended function and where loss of coating integrity would not impact the intended functions of downstream components.

Enhancements

The *Open-Cycle Cooling Water System* AMP is an existing program that will be enhanced to:

1. Perform periodic inspection, cleaning, and eddy current testing of the ‘A’ and ‘B’ Chiller condensers at least once every five years.

2. Perform a minimum of twenty inspections for recurring internal corrosion in raw water systems every 24 months until the rate of recurring internal corrosion occurrences no longer meets the criteria for recurring internal corrosion as defined in Section 3.3.2.2.7 of NUREG-2192. The selected inspection locations will be periodically reviewed to validate their relevance and usefulness and adjusted as appropriate. Evaluation of the inspection results will include (1) a comparison to the nominal wall thickness or previous wall thickness measurements to determine rate of corrosion degradation; (2) a comparison to the design minimum allowable wall thickness to determine the acceptability of the component for continued use; and (3) a determination of re-inspection interval.

3. Perform periodic internal visual inspections of the visible portion of the supply and return piping to the radwaste equipment cooling system from the condenser circulating water system intake piping in conjunction with the performance of the intake piping internal coating inspections. Visual inspections will be performed to identify direct evidence of internal degradation and indirect evidence of through wall leakage including the presence of backfill material or gravel within the pipe.

4. Provide additional guidance in procedures for inspections of non-ASME Code components for items such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes.

5. Provide additional guidance for trending of heat exchanger inspection results to evaluate the adequacy of inspection frequencies.

6. If inspections identify wall thickness below the minimum required wall thickness and the cause of the aging effect for each applicable material and environment is not corrected by repair or replacement for all components constructed of the same material and exposed to the same environment, additional inspections will be conducted. The number of increased inspections is determined in accordance with the corrective action program; however, no fewer than five additional inspections will be conducted for each inspection that did not meet acceptance criteria, or 20% of each applicable material, environment, and aging effect combination is inspected, whichever is less. The additional inspections include inspections at all of the units with the same material, environment, and aging effect combination.

7. Incorporate programmatic guidance contained in engineering support documents into controlled plant procedures subject to administrative controls in accordance with the Duke Energy QA program.

A2.12 Closed Treated Water Systems

Program Description

The *Closed Treated Water Systems* AMP is an existing program that manages cracking, loss of material, and reduction of heat transfer for components exposed to a closed treated water environment.

The *Closed Treated Water Systems* program is a mitigation program that also includes condition monitoring activities to monitor the effectiveness of the mitigation activities. The program consists of: (a) water treatment, including use of corrosion inhibitors, to modify the chemical composition of the water such that the effects of corrosion are minimized, (b) chemical testing to ensure water treatment maintains water chemistry within acceptable guidelines, and (c) inspections to determine the presence or extent of degradation. The program includes coupon testing to measure corrosion rates and microbiological testing. The program uses EPRI guidelines for chemistry control of closed cooling water systems.

Enhancements

The *Closed Treated Water Systems* AMP will be enhanced to:

1. Perform condition monitoring using techniques (visual, surface, or volumetric) capable of detecting loss of material, cracking, and fouling as appropriate. Perform visual inspections for loss of material and fouling whenever the system boundaries of the closed treated water systems are opened. Perform surface or volumetric examinations when susceptible materials are inspected for cracking.

2. In each ten year period during the SPEO, perform sufficient number of inspections to ensure that the minimum representative sample of 20% of the population up to 17 inspections per unit is met. A population is defined as components having the same material, water treatment program and aging effect combination. Perform inspections on those components that are more likely to be susceptible to aging based on time in service and severity of operating conditions.

3. Perform additional inspections when inspections do not meet acceptance criteria. Perform at least five additional inspections for every inspection not meeting acceptance criteria or 20% of each applicable material, environment, and aging effect combination, whichever is less.

4. Provide additional guidance in procedures for inspections of non-ASME Code components for items such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes.

5. Where practical, project the rate of any degradation until the next scheduled inspection or the end of the SPEO (whichever is shorter). Adjust the sampling bases (e.g., selection, size, frequency) as necessary based on the projections.

6. If subsequent inspections identify aging effects, the corrective action program will be used to determine the extent of condition and extent of cause to determine further extent of inspections. Perform additional inspections on all units with the same material, environment, and aging effect combinations and within the interval of the original inspection (e.g., refueling outage interval, 10-year inspection interval).

A2.13 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

Program Description

The *Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* AMP is an existing condition monitoring program that manages cracking, loss of material due to corrosion and wear, and loss of preload on bolted connections for cranes and hoists within the scope of SLR. The program includes periodic visual inspections to detect degradation of bridge, rail, and trolley structural components and bolted connections. This program relies on the guidance in NUREG-0612, "*Control of Heavy Loads at Nuclear Power Plants*," ASME B30.2, "*Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)*," and other appropriate standards in the ASME/ANSI B30 series to manage aging. These cranes must also comply with the maintenance rule requirements provided in 10 CFR 50.65.

Enhancements

The *Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* AMP will be enhanced to:

1. Provide additional procedural guidance to include visual inspections looking for deformation and cracking of bridges, structural members, and structural components.

2. Provide additional procedural guidance to specify bolted connections are monitored for loss of material, cracking, loose or missing bolts or nuts, and other conditions indicative of loss of preload.

3. Include evaluation of findings according to ASME B30.2 or other applicable ASME B30 series in applicable procedures.

4. Enhance maintenance procedures to ensure repairs are performed in accordance with ASME B30.2 or other applicable ASME B30 series in addition to manufacturers literature as necessary.

A2.14 Compressed Air Monitoring

Program Description

The *Compressed Air Monitoring* AMP is an existing preventive and condition monitoring program that manages loss of material downstream of the instrument air dryers. The program consists of monitoring moisture content, corrosion, and performance of the compressed air system. This includes (a) preventive monitoring of water (moisture) and other potentially corrosive contaminants to keep within the specified limits; and (b) opportunistic inspection of components for indications of loss of material due to corrosion. The program provides reasonable assurance of the integrity of the instrument air system components exposed to a dry air environment.

The *Compressed Air Monitoring* AMP is based on the Oconee responses to NRC GL 88-14, *"Instrument Air Supply Problems"* and INPO SOER 88-01, *"Instrument Air System Failures"*. The program also incorporates the air quality provisions provided in EPRI Compressed Air System Maintenance Guide (Report 1006677) and ANSI/ISA-7.0.01-1996, *"Instrument Society of America Quality Standard for Instrument Air"*. The program is informed by guidance in the American Society of Mechanical Engineers (ASME) operations and maintenance standards and guides (ASME OM-2012, Division 2, Part 28).

Enhancements

The *Compressed Air Monitoring* AMP will be enhanced to:

1. Perform opportunistic visual inspections of select component internal surfaces exposed to a dry air environment for signs of loss of material due to corrosion. Inspections will be performed by station personnel who have been qualified to the task per approved training procedures and programs. Acceptance criteria will ensure that internal surfaces that show signs of corrosion, that could indicate the potential loss of function of the component, are identified. The program will require corrective actions to be taken if loss of material due to corrosion is identified on internal surfaces of components.

A2.15 Fire Protection

Program Description

The *Fire Protection* AMP is an existing condition monitoring and performance monitoring program that includes fire barrier visual inspections and low pressure carbon dioxide system visual inspections and functional testing. The fire barrier inspection program requires periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, floors, fire dampers, and other materials that perform a fire barrier function. Periodic visual inspection and functional testing of the fire rated doors is performed to ensure that their functionality is maintained, and aging effects managed. The program also includes visual inspections and periodic functional tests of the standby shutdown facility CO_2 fire protection system using the NFPA Codes and Standards for guidance.

Enhancements

The *Fire Protection* AMP will be enhanced to:

1. Perform periodic visual inspection every 18 months for identification of corrosion that may lead to loss of material on the external surfaces of the standby shutdown facility CO_2 fire protection system.

A2.16 Fire Water System

Program Description

The *Fire Water System* AMP is an existing condition monitoring program that manages aging effects such as loss of material, cracking, and flow blockage associated with water-based fire protection system components. The program also manages loss of coating integrity of the internal coating of the elevated water storage tank. The program manages these aging effects by conducting periodic visual inspections, flow testing, and flushes using the guidance of the 2011 Edition of NFPA 25. Portions of water-based fire protection systems that have been wetted but are normally dry but periodically subject to flow have been confirmed to drain and are not subjected to augmented testing and inspections in addition to those specified in NFPA 25.

The high pressure service water system is normally maintained at required operating pressure and is monitored such that loss of system pressure is detected. The Keowee fire detection/ protection system is normally charged by static head from Lake Keowee. System flow downstream of the Keowee fire pump is monitored such that leakage from a normally stagnant line would be detected. Monitoring of operating parameters of the high pressure service water system and Keowee fire detection/protection system ensure prompt corrective actions can be initiated if leakage occurs.

Enhancements

The *Fire Water System* AMP will be enhanced to:

1. Perform internal visual inspections of deluge system piping by removing a hydraulically remote nozzle to identify internal corrosion, foreign material, and obstructions to flow. Internal visual inspections will be performed in 50% of the deluge systems within the scope of the *Fire Water System* AMP that are not subject to flow testing every five years. During the subsequent five year inspection period, the alternate systems will be inspected such that piping in 100 percent of the deluge systems within the scope of the program is inspected every ten years. Follow-up volumetric wall thickness examinations will be performed if internal visual inspections detect an unexpected level of degradation due to corrosion and corrosion product deposition.

2. Prior to fifty years in service, sprinkler heads will be submitted for field-service testing by a recognized testing laboratory consistent with NFPA 25, 2011 Edition, Section 5.3.1.

3. Perform a one-time volumetric wall thickness inspection on a representative sample deluge system supply piping that is periodically subjected to flow during functional testing.

4. Perform an obstruction investigation consistent with NFPA 25, 2011 Edition, Section 14.3 if evidence of unacceptable internal flow blockage that could result in failure of system function is identified during internal inspections. When unacceptable internal flow blockage is detected, corrective actions will include removal of the material, an extent of condition determination, review for increased inspections, follow-up examinations, and a flush consistent with NFPA 25 Annex D.5, *Flushing Procedures*.

5. Revise inspection procedures to provide additional inspection guidance regarding age-related degradation and to include inspection parameters for items such as lighting, distance, offset, presence of protective coatings, and cleaning processes.

6. Perform flow testing of at least one hose station in each building every five years to demonstrate the capability to provide the design pressure at required flow. Flow testing will be performed at the hydraulically most remote hose station or, if an alternative hose station is tested, the acceptance criteria for the test will account for the additional head loss that would occur if the hydraulically most remote hose station were tested such that the results of the flow test are representative of the limiting location. If acceptance criteria are not met, at least two additional tests shall be performed within five years. If subsequent tests do not meet acceptance criteria, an extent of condition and extent of cause analysis is conducted to determine the further extent of tests. The additional tests include at least one test at one of the other units with the same material, environment, and aging effect combination.

7. Perform external visual inspections of the elevated water storage tank consistent with Section 9.2.5.5 of NFPA 25, 2011 Edition at least once every two years.

8. Perform flushing of the mainline strainers following system actuation consistent with Section 10.2.7 of NFPA 25, 2011 Edition.

9. Perform main drain testing of the deluge system risers at least once every two years. Main drain testing of deluge systems will be performed consistent with the procedure described in Sections 13.2.5 and A.13.2.5 of NFPA 25, 2011 Edition. When there is a ten percent reduction in full flow pressure when compared to the original acceptance test or previously performed tests, the cause of the reduction shall be identified and corrected if necessary. If acceptance criteria are not met, at least two additional tests shall be performed within two years. If subsequent tests do not meet acceptance criteria, an extent of condition and extent of cause analysis is conducted to determine the further extent of tests. The additional tests include at least one test at one of the other units with the same material, environment, and aging effect combination.

10. Acceptance criteria and corrective actions for internal inspections of the elevated water storage tank will be in accordance with the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers and Tanks* program. Tank wall thickness

measurements will be conducted if interior pitting or general corrosion (beyond minor surface rust) is detected.

A2.17 Outdoor and Large Atmospheric Metallic Storage Tanks

Program Description

The *Outdoor and Large Atmospheric Metallic Storage Tanks* AMP is a new condition monitoring program that manages loss of material on the external surfaces of the Unit 1, 2, and 3 borated water storage tanks and ensures there is no significant degradation of the tank bottom. These are indoor large volume tanks that contain water and are designed with internal pressures approximating atmospheric that are sited on concrete. This program includes preventive measures to mitigate corrosion by protecting the external surfaces of steel components consistent with standard industry practices. The borated water storage tanks are internally coated and protected by missile barriers.

The program manages loss of material by conducting external visual surface inspections. Thickness measurements of the tank bottoms are conducted to ensure that significant degradation is not occurring. *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (A2.27) AMP will manage the internally coated surfaces of the borated water storage tanks. The *Structures Monitoring* AMP (A2.33) will manage the tank concrete foundations and the borated water storage tank superstructures that serve as missile barriers. Cracking is not a predicted aging effect due to the carbon steel construction.

Inspections not conducted in accordance with ASME Code, Section XI requirements are conducted in accordance with plant-specific procedures that include inspection parameters such as lighting, distance, offset, and surface conditions.

Industry and plant-specific OE will be considered in the development and implementation of this program.

Enhancements

None

A2.18 Fuel Oil Chemistry

Program Description

The Fuel Oil Chemistry program is an existing mitigative and condition monitoring program that relies on a combination of surveillance and maintenance procedures to manage loss of material from tanks, piping and components in a fuel oil environment and to maintain fuel oil quality. Exposure to fuel oil contaminants, such as water and microbiological organisms, is minimized by periodic cleaning/draining of tanks and by verifying the quality of new oil before its introduction into the storage tanks. The fuel oil contained in the standby shutdown facility fuel oil storage tank and the standby shutdown facility fuel oil day tank is maintained in accordance with Technical

Specification 5.5.14, *Standby Shutdown Facility (SSF) Diesel Fuel Oil Testing Program* and Surveillance Requirement 3.10.1.8.

The aging management acceptance criteria for each new fuel and stored fuel testing parameter has been established based on ASTM Standards including ASTM D2709, *Standard Test Method for Water and Sediment in Middle Distillate Fuels by Centrifuge*, ASTM D6217, *Standard Test Method for Particulate Contamination in Middle Distillate Fuels by Laboratory Filtration*, ASTM D4057, *Standard Practice for Manual Sampling of Petroleum and Petroleum Products,* and ASTM D975, *Standard Specification for Diesel Fuel Oils*.

The standby shutdown facility fuel oil storage tank and the standby shutdown facility fuel oil day tank are periodically drained of water and accumulated sediment and then cleaned. The standby shutdown facility fuel oil storage tank is also monitored quarterly for the presence of water by draining oil from the bottom of the tank and water is removed, if found.

Enhancements

The *Fuel Oil Chemistry* AMP will be enhanced to:

1. Monitor the standby shutdown facility fuel oil day tank quarterly for the presence of water by draining oil from the bottom of the tank and remove the water, if found.

2. Monitor the fuel oil stored in the standby shutdown facility fuel oil day tank quarterly for the presence of bacteria and fungus.

3. Perform volumetric wall thickness measurement of the standby shutdown facility fuel oil day tank if evidence of degradation is identified visually during the 10 year internal inspection.

A2.19 Reactor Vessel Material Surveillance

Program Description

The *Reactor Vessel Material Surveillance* AMP is an existing condition monitoring program that manages reduction of fracture toughness due to neutron irradiation embrittlement of the ferritic reactor pressure vessel beltline materials in a reactor coolant and neutron fluence environment. The program uses surveillance capsules containing reactor vessel material specimens that are located near the inside reactor pressure vessel wall in the beltline region so that the specimens duplicate, as closely as possible, the neutron spectrum, temperature history, and maximum neutron fluence experienced at the inner surface of the reactor vessel. As described in RIS 2014-11, beltline materials are those ferritic reactor vessel materials with a projected neutron fluence greater than 1.0E+17 n/cm^2 (E > 1 MeV) at the end of the license period (i.e., the SPEO). Because of the location of the capsules between the reactor core and the reactor vessel wall, the resulting lead factor allows surveillance capsules to achieve a neutron fluence exposure earlier than the inner surface of the reactor pressure vessel.

The program is part of an NRC approved integrated surveillance program that is based on the BWOG reactor vessel integrity program, which consisted of four B&W plant utilities, five Westinghouse plant utilities with B&W fabricated reactor vessels, and Framatome (formally B&W) and is now included within the PWROG. The program meets the requirements of 10 CFR Part 50, Appendix H, which requires the implementation of a reactor vessel material surveillance program when the peak neutron fluence at the end of the design life of the vessel exceeds 1.0E+17 n/cm^2 (E > 1 MeV).

The program provides sufficient material data and dosimetry to (a) monitor irradiation embrittlement to a neutron fluence level that is greater than the projected peak neutron fluence of interest projected to the end of the SPEO, and (b) provide adequate dosimetry monitoring during the SPEO. The *Reactor Vessel Material Surveillance* program is used in conjunction with the *Neutron Fluence Monitoring* program (A3.2) which monitors neutron fluence for reactor vessel components and reactor vessel internal components.

The *Reactor Vessel Material Surveillance* AMP is a condition monitoring program that measures the increase in Charpy V-notch 30 foot-pound (ft-lb) transition temperature and the drop in the upper-shelf energy as a function of neutron fluence and irradiation temperature. The reactor pressure vessel beltline material surveillance capsules are removed at various exposure intervals for monitoring and trending purposes. The reactor pressure vessel beltline material test results from the *Reactor Vessel Material Surveillance* AMP provide reactor vessel material fracture toughness data used to monitor neutron irradiation embrittlement of the reactor vessel and is provided as input to the neutron embrittlement TLAA (e.g., upper-shelf energy and pressure-temperature limits evaluations).

All surveillance capsules, including those previously withdrawn from the reactor vessel, must meet the test procedures and reporting requirements of the applicable ASTM standards referenced in 10 CFR Part 50, Appendix H, to the extent practicable, for the configuration of the specimens in the capsule. Any changes to the surveillance capsule withdrawal schedule must be approved by the NRC prior to implementation, in accordance with 10 CFR Part 50, Appendix H, Paragraph III.B.3.

Enhancements

None

A2.20 One-Time Inspection

Program Description

The *One-Time Inspection* AMP is a new condition monitoring program that will manage loss of material, cracking, and reduction of heat transfer of components exposed to treated borated water, treated water, waste water, raw water, air, condensation, underground, fuel oil, or lubricating oil environments. The program also manages loss of coating integrity for certain components that do not perform a pressure boundary intended function and where loss of coating integrity would not impact the intended functions of downstream components.

The *One-Time Inspection* AMP consists of a one-time inspection of selected components to verify: (a) the system wide effectiveness of an AMP that is designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the SPEO; (b) the insignificance of an aging effect; and (c) that long-term loss of material will not cause a loss of intended function for steel components exposed to environments that do not include corrosion inhibitors as a preventive action.

The elements of the program will include: (a) determination of the sample size of components to be inspected based on an assessment of materials of fabrication, environment, plausible aging effects, and OE, (b) identification of the inspection locations in the system or component based on the potential for the aging effect to occur, (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined, and (d) an evaluation of the need for follow-up examinations to monitor the progression of aging if age-related degradation is identified that could jeopardize an intended function before the end of the SPEO.

This program is not used for structures and components with known age-related degradation mechanisms or when the service environment in the SPEO is not expected to be equivalent to that in the prior operating period. Instead, other aging management programs, including programs that rely on periodic inspections, are used to manage age-related degradation of these structures and components. Inspections not conducted in accordance with ASME Code Section XI requirements will be conducted in accordance with plant-specific procedures including inspection parameters such as lighting, distance, offset, and surface conditions..

Industry and plant-specific OE will be considered in the development and implementation of this program.

<u>Enhancements</u>

None

A2.21 Selective Leaching

<u>Program Description</u>

The *Selective Leaching* AMP is a new condition monitoring program that will monitor components constructed of materials which are susceptible to selective leaching. Susceptible materials are gray cast iron, ductile iron, and copper alloys containing greater than 15% zinc or greater than 8% aluminum (aluminum bronze). The *Selective Leaching* program includes a one-time inspection for susceptible components exposed to closed cycle cooling water and treated water environments since plant-specific OE has not revealed evidence of significant selective leaching in these environments, as well as opportunistic and periodic inspections for susceptible components exposed to raw water, waste water, and soil (which may include groundwater) environments.

Visual inspections supplemented by mechanical examination techniques such as chipping or scraping (for ductile and gray cast iron components) will be conducted on a representative sample of susceptible components. In addition, periodic destructive examinations of components for physical properties (i.e., degree of dealloying, depth of dealloying, wall thickness, and chemical composition) will be conducted for components exposed to raw water, waste water, and soil environments. Inspections and tests will be conducted to determine whether loss of material due to selective leaching will affect the ability of the components to perform their intended function for the SPEO. Inspections will be conducted in accordance with plant-specific procedures including inspection parameters such as lighting, distance, offset and surface conditions as appropriate. When the acceptance criteria are not met such that it is determined that the affected component should be replaced prior to the end of the SPEO, additional inspections will be performed.

Industry and plant-specific OE will be considered in the development and implementation of this program.

Enhancements

None

A2.22 ASME Code Class 1 Small-Bore Piping

Program Description

The *ASME Code Class 1 Small-Bore Piping* AMP is a new condition monitoring program that will manage cracking in ASME Code Class 1 small-bore piping that is defined as greater than or equal to one-inch nominal pipe size (NPS) diameter and less than four inches NPS. The program augments the existing ASME Code, Section XI requirements and provides for examination of a sample of full penetration (butt) welds and partial penetration (socket) welds in Class 1 piping to manage cracking due to stress corrosion cracking or thermal or vibratory fatigue loading. Volumetric or destructive examinations will be employed to augment inspections performed by the *ASME Code, Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* (A2.1) AMP. This program provides for volumetric examination of a sample of full penetration (butt) welds and partial penetration (socket) welds in Class 1 piping to manage cracking due to stress corrosion cracking or thermal or vibratory fatigue loading.

Volumetric examinations will employ techniques that have been demonstrated to be capable of detecting flaws and discontinuities in the examination volume of interest. Destructive examination methods may be used in lieu of volumetric examination. The extent and schedule for volumetric examination in this program is based on plant-specific OE and whether actions have been implemented that effectively mitigate the cause(s) of any past cracking. One-time inspections and periodic inspections will determine the presence of cracking for locations within the scope of the *ASME Code Class 1 Small-Bore Piping* program. The program includes one-time inspections for a sample of the population of welds that have not experienced cracking and periodic inspections for a sample of the population of welds that have experienced cracking and have not implemented corrective actions to fully mitigate the cause(s) of the cracking for all similar welds (i.e., for all butt welds or all socket welds).

Age-related cracking has been experienced in ONS Class 1 small-bore piping butt weld populations and, therefore, the program will perform periodic examinations to monitor for cracking of butt welds within the scope of the *ASME Code Class 1 Small-Bore Piping* program. Periodic examinations of ten percent of the butt welds within the scope of this program will be performed every ten years, up to a maximum of 25 welds per unit. Since age-related cracking has not been identified in Class 1 small bore socket welded piping for ONS Units 1, 2 or 3, one-time examinations of these welds will be performed. One-time examinations of three percent of the socket welds within the scope of this program, up to a maximum of ten welds per unit, will be performed. If evidence of cracking is identified during the one-time inspections, periodic examinations of ten percent of the socket welds within the scope of this program will be performed every ten years.

Industry and plant-specific OE will be considered in the development and implementation of this program.

Enhancements

None

A2.23 External Surfaces Monitoring of Mechanical Components

Program Description

The *External Surfaces Monitoring of Mechanical Components* AMP is a new condition monitoring program that will manage the following aging effects:

- Loss of material, cracking, and reduction of heat transfer of metallic components;
- Hardening or loss of strength, loss of material, and cracking or blistering of polymeric components;
- Hardening or loss of strength, and loss of material of elastomeric components;
- Loss of material, cracking, and loss of preload for heating, ventilation, and air conditioning closure bolting; and
- Reduced thermal insulation resistance

Periodic visual inspections, not to exceed a refueling outage interval, of accessible surfaces of metallic, polymeric, and elastomeric components, and insulation metallic jacketing (or protective outer layer if metal jacketing is not used) will be conducted. For certain materials, such as flexible polymers and elastomers, physical manipulation or pressurization to detect hardening or loss of strength will be used to augment the visual examinations conducted under this program.

Surface examinations or ASME Code, Section XI, visual examinations (VT-1) will be conducted to detect cracking of copper alloy (>15% zinc or >8% aluminum) components.

A sample of outdoor component surfaces that are insulated and a sample of indoor insulated components exposed to condensation (due to the in scope component being operated below the dew point) will be periodically inspected every ten years during the SPEO.

Inspections not conducted in accordance with ASME Code Section XI requirements will be conducted in accordance with plant-specific procedures which include inspection parameters such as lighting, distance, offset, and surface conditions.

Acceptance criteria are such that the component will meet its intended function until the next inspection or the end of the SPEO. For qualitative evaluations, applicable parameters such as change in hardness, flexibility, or surface condition will be used to reasonably ensure that a consistent determination is made based on the observed conditions.

Industry and plant-specific OE will be considered in the development and implementation of this program.

Enhancements

None

A2.24 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

Program Description

The *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* AMP is a new condition monitoring program that will manage loss of material and cracking of metallic components, as well as loss of material, cracking, blistering, hardening, and loss of strength of polymeric and elastomeric materials. The program also manages loss of coating integrity for certain components that do not perform a pressure boundary intended function and where loss of coating integrity would not impact the intended functions of downstream components. Reduction of heat transfer and flow blockage will also be managed. This program will consist of visual inspections of internal surfaces of piping, piping components, ducting, heat exchanger components, polymeric and elastomeric components, and other mechanical components. Applicable environments include air, condensation, closed cycle cooling water, diesel exhaust, fuel oil, gas, lubricating oil, raw water, treated water, and waste water. Periodic visual (VT-1) or surface examinations will be performed to detect cracking of stainless steel components exposed to a diesel exhaust, potable raw water, and waste water and in copper alloys exposed to waste water. Visual inspections may be conducted in lieu of VT-1 or surface examinations where it has been analytically demonstrated that surface cracks can be detected by leakage prior to a crack challenging the structural integrity or intended function of the component. Except for hardening and loss of strength of elastomers, aging effects associated with components within the scope of the *Open Cycle Cooling Water System* (A2.11) AMP, *Closed Treated Water Systems* (A2.12) AMP, and *Fire Water System* (A2.16) AMP will not be managed by this program. The *Inspections* *of Internal Surfaces of Miscellaneous Piping and Ducting Components* is not relied on to manage recurring internal corrosion.

Internal inspections will be performed during the periodic system and component surveillances or during the performance of maintenance activities when the surfaces are made accessible for visual inspection. At a minimum, in each ten year period during the SPEO, a representative sample of twenty percent of the population (defined as components having the same combination of material, environment, and aging effect) or a maximum of 17 components per population per unit, where the sample size is not based on percentage of the population, will be inspected. Sample selection will consider component susceptibility to aging due to factors such as time in service and severity of operating conditions. Opportunistic inspections will continue in each period despite meeting the sampling limit. For certain materials, such as flexible polymers, physical manipulation to detect hardening or loss of strength will be used to augment the visual examinations conducted under this program.

Inspections not conducted in accordance with ASME Code Section XI requirements will be conducted in accordance with plant-specific procedures which include inspection parameters such as lighting, distance, offset, and surface conditions. Acceptance criteria will ensure that the component will meet its intended function until the next inspection or the end of the SPEO. Qualitative acceptance criteria are clear enough to reasonably assure a singular decision is derived based on observed conditions.

Industry and plant-specific OE will be considered in the development and implementation of this program.

Enhancements

None

A2.25 Lubricating Oil Analysis

Program Description

The *Lubricating Oil Analysis* AMP is an established program intended to avoid the loss of material and reduction of heat transfer to in-scope components by maintaining the quality of the lubricating oil and hydraulic oil. The program provides reasonable assurance that contaminants (particularly water and particulates) are maintained within acceptable limits. Testing activities include sampling and analysis of lubricating oil and hydraulic oil using manufacturer, industry and ASTM guidelines.

Enhancements

The *Lubricating Oil Analysis* AMP will be enhanced to:

1. Update the *Lubricating Oil Analysis* program procedures to specify that in all cases, phase-separated water in any amount is not acceptable.

A2.26 Buried and Underground Piping and Tanks

Program Description

The *Buried and Underground Piping and Tanks* AMP is an existing condition monitoring program that manages the aging effects associated with the external surfaces of buried and underground piping and tanks including loss of material and cracking of components in soil or underground environments within the scope of SLR. The program addresses piping and tanks of any material, including carbon steel, ductile iron, gray cast iron, stainless steel and copper alloys. There are no buried or underground cementitious or polymeric piping or tanks within the scope of SLR at Oconee. Condition monitoring of the buried and underground piping and tanks relies on inspections conducted by qualified individuals.

The program also manages aging through preventive and mitigative actions (i.e., coatings, backfill quality, and cathodic protection). The number of inspections is based on the effectiveness of the preventive and mitigative actions. Annual cathodic protection surveys are conducted. The acceptance criteria for cathodic protection system effectiveness is -850 mV relative to copper/copper sulfate reference electrode.

Enhancements

The *Buried and Underground Piping and Tanks* AMP will be enhanced to:

1. Install a cathodic protection system in accordance with NACE SP0169-2007 for buried carbon steel piping within the scope of this program.

2. Complete a modification to abandon the buried copper alloy instrument air system piping within the scope of this program.

3. Annual cathodic protection system monitoring will be performed with a maximum grace period of two months. The system will be monitored at least once during each calendar year.

4. Utilize an inspection method that has been demonstrated to be capable of detecting cracking for uncoated stainless steel piping and when visual inspections of coated stainless steel piping detect coating degradation or damage which could potentially result in stress corrosion cracking of the base material. Indications of cracking will be evaluated in accordance with applicable codes and plant-specific design criteria.

5. Perform wall thickness measurement if visual inspections identify evidence of corrosion beyond minor surface rusting for both coated and uncoated metallic piping or tanks. The results of the wall thickness measurement will be used to calculate a corrosion rate and project wall thickness through the end of the SPEO. If the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material is extrapolated to the end of the SPEO, then additional inspections will be performed as follows: When measured pipe wall thickness, projected to the end of the SPEO, does not meet the minimum pipe wall thickness requirements due to external

corrosion, the number of inspections within the affected piping category will be doubled or increased by five, whichever is smaller. If adverse indications are found in the expanded sample, an extent of condition and extent of cause analysis to determine the further extent of inspections. Timing of any additional inspections will be based on the severity of the identified degradation and the consequences of leakage or loss of function. Any additional inspections will be performed within the same 10-year inspection interval in which the original degradation was identified, or within four years after the end of the 10-year interval if the degradation was identified in the latter half of the 10-year interval. Expansion of sample size may be limited by the extent of piping subject to the observed degradation mechanism or if the piping system or portion of the system is replaced or otherwise mitigated within the same 10-year inspection interval in which the original degradation was identified or within four years after the end of the 10-year interval, if the degradation was identified in the latter half of the 10-year interval.

6. Perform inspections of buried steel condenser circulating water system piping at least once every ten years. The minimum number of inspections will be determined based on the effectiveness of preventive actions in accordance with NUREG-2191, Table XI.M41-2. Ten linear feet of piping will be exposed for each inspection. Inspections of the large diameter condenser circulating water system intake piping will expose a quadrant (i.e., 9 to 12 o'clock or 12 to 3 o'clock) of the piping. External inspections of the large diameter condenser circulating water system intake piping will be supplemented by low frequency electromagnetic testing performed from the internal surface of the same section of piping that is externally inspected with follow-up ultrasonic wall thickness measurements performed of areas identified as low points during low frequency electromagnetic testing.

7. Perform visual inspections of at least two ten-linear foot sections of buried uncoated stainless steel piping at least once every ten years. Piping inspection locations will be selected based on risk (i.e., susceptibility to degradation and consequences of failure).

8. Perform visual inspections of at least four ten linear foot sections of underground coated steel piping at least once every ten years. Piping inspection locations will be selected based on risk (i.e., susceptibility to degradation and consequences of failure).

9. Internal volumetric inspections of the standby shutdown facility diesel engine fuel oil tank will cover at least 25% of the surface area of the tank and include at least some of both the top and bottom of the tank.

10. Personnel performing inspections of buried coated piping and tanks will either: 1) possess an Association for Materials Protection and Performance coating inspector program level 2 or level 3 inspector qualification, 2) complete the EPRI *Comprehensive Coatings Course* and complete the EPRI *Buried Pipe Condition Assessment and Repair Training Computed Based Training Course*, or 3) be qualified as a coatings specialist in accordance with ASTM D7108.

11. If significant coating damage is identified during visual inspections, then perform an evaluation to determine if the coating damage was caused by nonconforming backfill. If it is determined that the coating damage was caused by nonconforming backfill, then

conduct an extent of condition evaluation to determine the extent of degraded backfill in the vicinity of the observed damage.

A2.27 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers and Tanks

Program Description

The *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* AMP is a new condition monitoring program that manages degradation of internal coatings/linings exposed to raw water, treated water, treated borated water, or lubricating oil that can lead to loss of base metal material or downstream effects such as reduction in flow, pressure, or heat transfer when coatings/linings become debris. There are no internally coated or lined piping, piping components, heat exchangers, or tanks exposed to closed-cycle cooling water, waste water, fuel oil, air or condensation within the scope of this program and the program is not used to manage loss of coating integrity of external coatings.

This program manages these aging effects for internal coatings by conducting periodic visual inspections of all coatings/linings applied to the internal surfaces of in scope components where loss of coating or lining integrity could impact the component's or downstream component's CLB intended functions.

For tanks and heat exchangers, all accessible surfaces are inspected. Piping inspections are sampling based. The training and qualification of individuals involved in coating/lining inspections of non-cementitious coatings/linings are conducted in accordance with ASTM International Standards endorsed in RG 1.54, *"Service Level I, II and II Protective Coatings Applied to Nuclear Power Plants,"* including the NRC guidance contained in RG 1.54 associated with a particular standard. For cementitious coatings, training and qualifications are based on an appropriate combination of education and experience related to inspecting concrete surfaces. Peeling and delamination is not acceptable. Blisters are evaluated by a coatings specialist, and should be limited to a few intact small blisters that are completely surrounded by sound material, and with size and frequency not increasing. Minor cracks in cementitious coatings are acceptable provided there is no evidence of debonding. All other degraded conditions are evaluated by a coatings specialist. For coated/lined surfaces determined to not meet the acceptance criteria, physical testing is performed where physically possible (i.e., sufficient room to conduct testing) in conjunction with repair or replacement of the coating/lining.

Aging of the internal coating for the elevated water storage tank will be managed as described in the *Fire Water System* (A2.16) program.

Industry and plant-specific OE will be considered in the development and implementation of this program.

Enhancements

None

A2.28 ASME XI, Subsection IWE

Program Description

The *ASME Section XI, Subsection IWE* AMP is an existing condition monitoring program that manages cracking, loss of material, loss of sealing, loss of preload, and loss of leak tightness. This program is in accordance with ASME Section XI, Subsection IWE, consistent with 10 CFR 50.55a *"Codes and Standards*," with supplemental recommendations. The *ASME Section XI, Subsection IWE* program includes periodic visual, surface, and volumetric examinations, where applicable, of the metallic pressure-retaining components of the concrete containment for signs of degradation, damage, irregularities including discernible liner plate bulges, and for coated areas, distress that might be indicative of degradation of the underlying metal shell or liner, and corrective actions. Acceptability of inaccessible areas of the concrete containment steel liner is evaluated when conditions found in accessible areas, indicate the presence of, or could result in, flaws or degradation in inaccessible areas.

The program includes supplemental surface or enhanced examinations to detect cracking for specific pressure-retaining components. Containment liners and penetrations were analyzed for cyclic fatigue and do not require surface examinations in addition to visual examinations to detect cracking in stainless steel and dissimilar metal welds of penetration sleeves and components that are subject to cyclic loading. A one-time volumetric examination of metal liner surfaces that are inaccessible from one side will be performed if triggered by plant-specific OE. This supplemental volumetric examination consists of a sample of one-foot square locations that include both randomly selected and focused areas most likely to experience degradation based on operating experience and/or relevant considerations such as environment. Inspection results will be compared with prior recorded results in acceptance of components for continued service.

In conformance with 10 CFR 50.55a(g)(4)(ii), the *Containment Inservice Inspection* AMP will be updated during each successive 120 month inspection interval to comply with the requirements of the latest edition and addenda of the Code specified 12 months before the start of the inspection interval.

Enhancements

The *ASME Section XI, Subsection IWE* AMP will be enhanced to:

1. Specify that for "high strength" structural bolting consisting of ASTM A325, ASTM F1852, and/or ASTM A490 bolts, the preventive actions for storage, lubrication, and stress corrosion cracking potential discussed in Section 2.0 of RCSC (Research Council for Structural Connections) publication *"Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts,"* will be used.

2. Include inspection attributes for the aging mechanisms listed in NUREG-2191. For non-coated surfaces this includes evidence of cracking, discoloration, wear, pitting, excessive corrosion, arc strikes, gouges, surface discontinuities, dents, and other signs of surface irregularities including discernible liner plate bulges. For painted or coated surfaces this includes evidence of flaking, blistering, peeling, discoloration, and other signs of potential distress of the underlying metal shell or liner system, including discernible liner plate bulges.

3. Specify a one-time volumetric examination of metal liner surfaces that are inaccessible from one side if triggered by plant-specific OE. The trigger for this supplemental examination is plant-specific occurrence or recurrence of measurable metal liner corrosion (base metal material loss exceeding 10% of nominal plate thickness) initiated on the inaccessible side or areas, identified since the date of issuance of the first renewed license. This supplemental volumetric examination consists of a sample of one-foot square locations that include both randomly-selected and focused areas most likely to experience degradation based on operating experience and/or other relevant considerations such as environment. The supplemental volumetric examinations for each unit will occur within two refueling outages after identifying the trigger for the examination. Any identified degradation is addressed in accordance with the applicable provisions of the ASME Section XI, Subsection IWE program. The sample size, locations, and any needed scope expansion (based on findings) for this one-time set of volumetric examinations should be determined on a plant-specific basis to demonstrate statistically with 95% confidence that 95% of the accessible portion of the containment liner is not experiencing corrosion degradation with greater than 10% loss of nominal thickness.

A2.29 ASME XI, Subsection IWL

Program Description

The *ASME Section XI, Subsection IWL* AMP is an existing condition monitoring program that manages the following effects for containment concrete and post-tensioning system: cracking, loss of material, loss of material (spalling, scaling), distortion, loss of bond, and increase in porosity and permeability. The program is in accordance with ASME Section XI, Subsection IWL, and consistent with 10 CFR 50.55a, *"Codes and Standards."* In conformance with 10 CFR 50.55a(g)(4)(ii), the Containment Inservice Inspection program will be updated during each successive 120 month inspection interval to comply with the requirements of the latest edition and addenda of the code specified 12 months before the start of the inspection interval.

This AMP includes inspection of tendon and anchorage hardware surfaces and measurement of tendon force and elongation. The program also includes inspection of containment reinforced concrete above ground for evidence of concrete degradation. The ASME Section XI, Subsection IWL AMP consists of (a) periodic visual inspection of accessible concrete surfaces for the reinforced and prestressed concrete containments, (b) periodic visual inspection and sample tendon-testing of unbonded post-tensioning system components for signs of degradation, assessment of damage, and corrective actions, and (c) testing of the tendon corrosion protection medium and free water.

Measured tendon lift-off forces in select sample tendons are compared to predicted tendon group forces calculated using the guidance presented in NRC RG 1.35.1, *"Determining Prestressing Forces for Inspection of Prestressed Concrete Containments."* The Subsection IWL requirements are supplemented to include quantitative acceptance criteria for the evaluation of concrete surfaces based on the "*Evaluation Criteria"* provided in Chapter 5 of American Concrete Institute (ACI) 349.3R, *"Evaluation of Existing Nuclear Safety-Related Concrete Structures."* Inspection results are compared with prior recorded results in acceptance of components for continued service.

<u>Enhancements</u>

The *ASME Section XI, Subsection IWL* AMP will be enhanced to:

1. Incorporate monitoring for changes in material properties of increase in porosity and permeability, and loss of strength and pattern cracking with darkened edges.

2. Specify that inspection results are documented and compared to previous results to identify changes from prior inspections.

A2.30 ASME XI, Subsection IWF

<u>Program Description</u>

The *ASME Section XI, Subsection IWF* AMP is an existing condition monitoring program that manages loss of material, cracking, loss of preload, and loss of mechanical function for supports of Class 1, 2, and 3 components. This program consists of periodic visual examinations of piping and component supports for signs of degradation, evaluation, and corrective actions. Supports for Class 1, 2, and 3 piping and component supports are selected for examination per the requirements of ASME Code, Section XI, Subsection IWF. Acceptance standards are specified in ASME Code, Section XI, Subsection IWF, Article IWF-3400. If a component support does not meet the acceptance standards of IWF-3400 but is electively repaired to as new condition, the sample is increased or modified to include another support that is representative of the remaining population of supports that were not repaired. The scope of the inspection for supports is based on class and total population as defined in Table IWF-2500-1. Inspections that reveal indications or relevant conditions that are unacceptable are entered in the corrective actions program.

This program recommends additional inspections beyond the inspections required by the 10 CFR 50.55a *ASME Section XI, Subsection IWF* AMP. This includes a one-time inspection within five years prior to entering the SPEO of an additional 5% of the sample populations of Class 1, 2, and 3 piping supports. The additional supports will be selected from the remaining population of IWF piping supports and will include components that are most susceptible to age-related degradation. For high strength bolting with an actual yield strength equal to or greater than 150 ksi in sizes greater than one inch nominal diameter, volumetric examination comparable to that of ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1 will be performed to detect cracking in addition to the VT-3 examination. Examinations that reveal indications are evaluated. Evaluations that find relevancy is substantiated and the condition is unacceptable then a corrective action is generated.

<u>Enhancements</u>

The *ASME Section XI, Subsection IWF* AMP will be enhanced to:

1. Perform periodic evaluations of the acceptability of inaccessible areas of supports (e.g., portions of supports encased in concrete, buried underground, or encapsulated by guard pipe), when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas of supports. Perform these evaluations once every ten years during the SPEO.

2. Procedures will be revised to specify that for structural bolting consisting of ASTM A325, ASTMF1852, and/or ASTM A490, the preventative actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for Structural Connections) publication, "*Specification for Structural Joints Using ASTM A325 or A490 Bolts*," will be used.

3. Procedures will be revised to specify that whenever replacement of bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants will be in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339.

4. Perform a one-time inspection within five years prior to entering the SPEO of an additional 5% of the sample populations for Class 1, 2, and 3 piping supports. The additional supports will be selected from the remaining population of IWF piping supports and will include components that are most susceptible to age-related degradation.

5. Procedures will be revised to specify that, for NSSS component supports, high strength bolting greater than one-inch nominal diameter, volumetric examination comparable to that of ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1 will be performed to detect cracking in addition to the VT-3 examination. In each 10-year period during the SPEO, a representative sample of bolts will be inspected. The sample of high-strength bolting greater than one-inch nominal diameter subject to volumetric examination will consist of 17 bolts per unit. The sample shall include the bolting that is most susceptible to age-related degradation (i.e., based on time in service, aggressive environment, etc.).

6. If a component does not exceed the acceptance standards of IWF-3400 but is repaired to as new condition, the sample is increased or modified to include another support that is representative of the remaining population of supports that were not repaired.

A2.31 10 CFR Part 50 Appendix J

Program Description

The *10 CFR Part 50, Appendix J* AMP is an existing performance monitoring program that consists of monitoring leakage rates through the containment pressure retaining boundary, including associated welds, penetrations, isolation valves, and other access openings and attachments. Leakage monitoring activities are credited to indirectly detect cracking, loss of material, loss of preload, and loss of sealing of the containment pressure boundary. Corrective actions are taken if leakage rates exceed acceptance criteria. Consistent with the CLB, the containment leak rate tests are performed in accordance with the regulations and guidance provided in 10 CFR Part 50 Appendix J, Option B; RG 1.163, "*Performance-Based Containment Leak-Test Program*", and NEI 94-01, "*Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J*", and subject to the requirements of 10 CFR Part 54, "*Requirements for Renewal of Operating Licenses for Nuclear Power Plants*."

Enhancements

None

A2.32 Masonry Walls

Program Description

The *Masonry Walls AMP* is an existing condition monitoring program that is implemented as part of the *Structures Monitoring* (A2.33) AMP and manages cracking, loss of material, and loss of material (spalling and scaling) that could impact the intended function of the masonry walls. The *Masonry Walls* AMP consists of inspections, consistent with Inspection and Enforcement Bulletin 80-11, and plant-specific monitoring, proposed by Information Notice 87-67, for managing shrinkage, separation, gaps, loss of material and cracking of masonry walls such that the evaluation basis is not invalidated and intended functions are maintained.

Enhancements

The *Masonry Walls* AMP will be enhanced to:

1. Update the parameters monitored to identify potential shrinkage and/or separation of masonry walls and include loss of material in addition to the currently managed cracking at joints.

A2.33 Structures Monitoring

Program Description

The *Structures Monitoring* AMP is an existing condition monitoring program that consists of periodic visual inspection and monitoring of the condition of concrete and steel structures, structural components, component supports, and structural commodities to ensure that aging degradation (such as those described in ACI 349.3R, ACI 201.1R, SEI/ASCE 11, and other documents) will be detected, the extent of degradation determined and evaluated, and corrective actions taken prior to loss of intended functions. Structures are monitored on an interval of a nominal five years. The interval may be increased to a nominal ten year frequency with appropriate justification based on the structure, environment and related inspections. Inspections also include seismic joint fillers, elastomeric materials; and reinforcement of masonry walls, and periodic evaluation of groundwater chemistry and opportunistic inspections for the condition of below grade concrete.

Quantitative results (measurements) and qualitative information from periodic inspections are trended with sufficient detail, such as photographs and surveys for the type, severity, extent, and progression of degradation, to ensure that corrective actions can be taken prior to a loss of intended function. The acceptance criteria are derived from applicable consensus codes and standards. For concrete structures, the program includes personnel qualifications and quantitative evaluation criteria of ACI 349.3R.

<u>Enhancements</u>

The *Structures Monitoring* AMP will be enhanced to:

1. Add the following structures to the scope of the program:

    a. Microwave House Structure
    b. Technical Support Building cable vault
    c. 100kv Structure
    d. Protected Service Water Building
    e. Protected Service Water Duct Banks
    f. Borated Water Storage Tank Superstructure
    g. Health Physics Office Building
    h. Administration Building

2. Procedures will be revised to specify that structural components inspected include structural bolting, anchor bolts and embedments, supports and bracings associated with masonry walls, pipe whip restraints and jet impingement shields, transmission towers, panels and other enclosures, racks, sliding surfaces, sump and pool liners, electrical cable trays and conduits, tube tracks, electrical duct banks, manholes, doors, penetration seals, and other elastomeric materials.

3. Expand the monitoring and evaluation of raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of SLR:

    a. Enter adverse results, which exceed water chemistry criteria, into the corrective action program. As part of the corrective actions, if aggressive groundwater is identified that might affect structures in scope for SLR, perform additional water testing at additional locations and perform soil testing in order to confirm the extent, severity, and potential aging mechanisms resulting from the aggressive groundwater/ soil.

b. Develop engineering evaluations to evaluate the water chemistry results to assess the impact, if any, on below-grade concrete, including the potential for further degradation due to the aggressive groundwater, as well as consideration of current conditions. As part of the engineering evaluations, determine if additional actions are warranted, which might include enhanced inspection techniques and/or increased frequency, destructive testing, and focused inspections of representative accessible (leading indicator) or below grade, inaccessible concrete structural elements exposed to aggressive groundwater/soil.
c. Develop the initial engineering evaluations prior to the SPEO. Develop follow-up engineering evaluations on an interval not to exceed five years.
d. If aggressive groundwater and soil is identified, at a minimum, perform focused inspections of representative, accessible (leading indicator) structural elements, or if accessible areas will not be leading indicators for the potential aging mechanisms, excavate and inspect buried concrete elements exposed to aggressive groundwater/ soil.
e. If degraded concrete is identified, as part of the focused inspections of leading indicators (representative, accessible or exposed inaccessible concrete), enter adverse results that exceed ACI 349.3R second tier criteria into the corrective action program, and expose inaccessible concrete so that the extent of the condition can be determined, baseline conditions documented, and additional actions identified such as repairs, new preventative actions, additional evaluations, and future inspections.

4. For structural bolting consisting of ASTM A325, ASTMF1852, and/or ASTM A490, provide guidance for storage, lubricants, and the steps to minimize stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for Structural Connections) publication, "*Specification for Structural Joints Using ASTM A325 or A490 Bolts*".

5. Provide guidance so that when replacement bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants will be in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339.

6. Provide guidance for proper specification of new high strength bolting material and lubricant to prevent or mitigate degradation and failure of structural bolting in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339.

7. Expand the program to include details regarding inspection and evaluation for steel liners.

8. Provide inspection and evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. The program will be enhanced to explicitly mention the changes in material properties of increase in porosity and permeability, and loss of strength and pattern cracking with darkened edges.

9. Develop a new implementing procedure or revise an existing implementing procedure to address aging management of inaccessible areas exposed to potentially aggressive groundwater/soil environment that will include the following:

    a. Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of SLR.
    b. Enter adverse results, which exceed water chemistry criteria, into the corrective action program. As part of the corrective actions, if aggressive groundwater is identified that might affect structures in scope for SLR, perform additional water testing at additional locations and perform soil testing in order to confirm the extent, severity, and potential aging mechanisms resulting from the aggressive groundwater/soil.
    c. Develop engineering evaluations to evaluate the water chemistry results to assess the impact, if any, on below-grade concrete, including the potential for further degradation due to the aggressive groundwater, as well as consideration of current conditions. As part of the engineering evaluations, determine if additional actions are warranted, which might include enhanced inspection techniques and/or increased frequency, destructive testing, and focused inspections of representative accessible (leading indicator) or below grade, inaccessible concrete structural elements exposed to aggressive groundwater/soil.
    d. Develop the initial engineering evaluations prior to the SPEO. Develop follow-up engineering evaluations on an interval not to exceed five years.
    e. If aggressive groundwater and soil is identified, at a minimum, perform focused inspections of representative, accessible (leading indicator) structural elements, or if accessible areas will not be leading indicators for the potential aging mechanisms, excavate and inspect buried concrete elements exposed to aggressive groundwater/soil.
    f. If degraded concrete is identified, as part of the focused inspections of leading indicators (representative, accessible or exposed inaccessible concrete), enter adverse results that exceed ACI 349.3R second tier criteria into the corrective action program, and expose inaccessible concrete so that the extent of the condition can be determined, baseline conditions documented, and additional actions identified such as repairs, new preventative actions, additional evaluations, and future inspections.

10. Monitor and trend through-wall groundwater leakage, infiltration volumes, and leakage water chemistry for signs of concrete or steel reinforcement degradation. Develop additional engineering evaluations, which consider more frequent inspections, as well as destructive testing of affected concrete to validate existing concrete properties, and leakage water chemistry results. If leakage volumes allow, consider water chemistry analysis of the leakage pH, along with mineral, chloride, sulfate and iron content in the water.

11. Expand the program to monitor accessible sliding surfaces for indications of significant loss of material due to wear or corrosion, and for accumulation of debris or dirt. Establish acceptance criteria for sliding surfaces as no significant loss of material due to wear or

corrosion, and no debris or dirt that could restrict or prevent sliding of the surfaces, as required by design.

12. Expand the program to monitor elastomeric vibration isolators and bearing pads, structural sealants, and seismic joint fillers for cracking, loss of material, and hardening. Supplement visual inspection of elastomeric elements with tactile inspection to detect hardening, if the intended function is suspect. Establish acceptance criteria for elastomeric pads and vibration isolation elements, structural sealants, and seismic joint fillers, as no loss of material, cracking, or hardening that can lead to loss of isolation or support function.

13. Require that personnel performing inspections and evaluations meet the qualifications specified within ACI 349.3R with respect to knowledge of inservice inspection of concrete and visual acuity requirements.

14. Perform inspections under the enhanced program in order to establish quantitative baseline inspection data to a sufficient detail to allow for trending, prior to the SPEO.

15. Revise inspection procedures to base inspection acceptance criteria on quantitative requirements derived from industry codes and standards, including but not limited to ACI 349.3R, ACI 318, SEI/ASCE 11, or the relevant AISC specifications and consider industry and plant OE. Use justified quantitative acceptance criteria whenever applicable.

16. Provide evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. Base the acceptance criteria for concrete surfaces on the "second-tier" evaluation criteria provided in Chapter 5 of ACI 349.3R.

17. Clarify that loose bolts and nuts are not acceptable unless accepted by engineering evaluation.

A2.34 Inspection of Water-Control Structures Associated with Nuclear Power Plants

Program Description

The *Inspection of Water-Control Structures Associated with Nuclear Power Plants* AMP is an existing condition monitoring program that consists of inspection and surveillance of the raw water control structures associated with emergency cooling systems, emergency power production or flood control. The scope of the program also includes structural steel, and structural bolting associated with water control structures, steel or wood piles and sheeting required for the stability of embankments and channel slopes, and miscellaneous steel, such as sluice gates and trash racks. In general, parameters monitored are in accordance with Section C.2 of RG 1.127 and quantitative measurements are recorded for findings that exceed the acceptance criteria for applicable parameters monitored or inspected. Inspections are performed at least once every five years for structural components. Structures exposed to aggressive water require additional plant-specific investigation.

The aging management of the condenser circulating water discharge pipe, Keowee intake and penstock, as well as portions of the Keowee powerhouse and condenser circulating water intake structure are within the scope of the *Inspection of Water-Control Structures Associated with Nuclear Power Plants* AMP. The inspections are performed under the current Inspection program for civil engineering structures and components. Any enhancements described in this AMP apply to the *Structures Monitoring* (A2.33) program with respect to aging management activities associated with the condenser circulating water discharge pipe, Keowee intake, and penstock, as well as portions of the Keowee powerhouse and condenser circulating water intake structure, which are within the scope of this program.

The aging management of dams and dikes at Oconee is within the scope of the *Inspection of Water-Control Structures Associated with Nuclear Power Plants* AMP. Aging management is performed in accordance with the FERC five year inspection requirements. The inspections of dams and dikes within the scope of this program include inspections of the Keowee river dam; Keowee spillway and left abutment, Keowee intake and powerhouse; little river dam; little river dikes A, B, C, and D; and the Oconee intake canal dike, which are performed in accordance with the requirements contained in *Title 18 of the Code of Federal Regulations, Conservation of Power and Water Resources, Part 12, Safety of Water Power Projects and Project Works, Subpart D* (Inspection by Independent Consultant). Aging management activities include visual inspections by a qualified independent consultant approved by FERC, and submittal of inspection reports with corrective actions that are approved by FERC. The inspections performed under the FERC five year inspection program have been approved by FERC, and are the CLB for Oconee regarding aging management of these dams and dikes. Oconee will continue to comply with these FERC requirements during the SPEO. Specific corrective actions and confirmation of corrective actions are implemented in accordance with the corrective action program. The enhancements described in this AMP do not apply to those structures managed in accordance with FERC requirements.

Enhancements

The *Inspection of Water-Control Structures Associated with Nuclear Power Plants* AMP will be enhanced to:

1. Provide guidance for structural bolting consisting of ASTM A325, ASTMF1852, and/or ASTM A490, for storage, lubricants, and the steps to minimize stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for Structural Connections) publication, *“Specification for Structural Joints Using ASTM A325 or A490 Bolts”*.

2. Provide guidance so that when replacement bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants will be in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339.

3. Provide guidance for proper specification of new high strength bolting material and lubricant to prevent or mitigate degradation and failure of structural bolting in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339.

4. Provide inspection and evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. The program will be enhanced to incorporate monitoring for movements (e.g., settlement, heaving, and deflection), conditions at junctions with abutments and embankments, pattern cracking with darkened edges, the changes in material properties of increase in porosity and permeability, and loss of strength.

5. Expand the program to monitor accessible sliding surfaces for indications of significant loss of material due to wear or corrosion, and for accumulation of debris or dirt. Establish acceptance criteria for sliding surfaces as no significant loss of material due to wear or corrosion, and no debris or dirt that could restrict or prevent sliding of the surfaces, as required by design.

6. Require that personnel performing inspections and evaluations meet the qualifications specified within ACI 349.3R with respect to knowledge of inservice inspection of concrete and visual acuity requirements.

7. Create provisions for special inspections immediately following the occurrence of significant natural phenomena, such as large floods, earthquakes, hurricanes, tornadoes, or intense local rainfalls.

8. Require the evaluation of raw water and groundwater chemistry that is sampled from a location that is representative of the water in contact with structures within the scope of SLR by the responsible engineer. This will be done on an interval not to exceed five years and account for seasonal variations (e.g., quarterly monitoring every fifth year).

9. Develop a new implementing procedure or revise an existing implementing procedure to enhance the aging management of inaccessible areas exposed to potentially aggressive groundwater/soil environment that will include the following:

   a. Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of SLR.
   b. Enter adverse results, which exceed water chemistry criteria, into the corrective action program. As part of the corrective actions, if aggressive groundwater is identified that might affect structures in scope for SLR, perform additional water testing at additional locations and perform soil testing in order to confirm the extent, severity, and potential aging mechanisms resulting from the aggressive groundwater/soil.
   c. Develop engineering evaluations to evaluate the water chemistry results to assess the impact, if any, on below-grade concrete, including the potential for further degradation due to the aggressive groundwater, as well as consideration of current conditions. As part of the engineering evaluations, determine if additional actions are warranted, which might include enhanced inspection techniques and/or increased frequency, destructive testing, and focused inspections of representative accessible

(leading indicator) or below grade, inaccessible concrete structural elements exposed to aggressive groundwater/soil.

d. Develop the initial engineering evaluations prior to the SPEO. Develop follow-up engineering evaluations on an interval not to exceed five years.
e. If aggressive groundwater and soil is identified, at a minimum, perform focused inspections of representative, accessible (leading indicator) structural elements, or if accessible areas will not be leading indicators for the potential aging mechanisms, excavate and inspect buried concrete elements exposed to aggressive groundwater/ soil.
f. If degraded concrete is identified, as part of the focused inspections of leading indicators (representative, accessible or exposed inaccessible concrete), enter adverse results that exceed ACI 349.3R second tier criteria into the corrective action program, and expose inaccessible concrete so that the extent of the condition can be determined, baseline conditions documented, and additional actions identified such as repairs, new preventative actions, additional evaluations, and future inspections.

10. Monitor and trend through-wall groundwater leakage, infiltration volumes, and leakage water chemistry for signs of concrete or steel reinforcement degradation. Develop additional engineering evaluations, which consider more frequent inspections, as well as destructive testing of affected concrete to validate existing concrete properties, and leakage water chemistry results. If leakage volumes allow, consider water chemistry analysis of the leakage pH, along with mineral, chloride, sulfate and iron content in the water.

11. Perform inspections under the enhanced program in order to establish quantitative baseline inspection data to a sufficient detail to allow for trending, prior to the SPEO.

12. Provide evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. Base the acceptance criteria for concrete surfaces on the “second-tier” evaluation criteria provided in Chapter 5 of ACI 349.3R.

13. Clarify that loose bolts and nuts are not acceptable unless accepted by engineering evaluation.

14. Degradation of piles and sheeting are accepted by engineering evaluation or subject to corrective actions.

15. Revise inspection procedures to base inspection acceptance criteria on quantitative requirements derived from industry codes and standards, including but not limited to ACI 349.3R, ACI 318, SEI/ASCE 11, or the relevant AISC specifications and consider industry and plant OE. Use justified quantitative acceptance criteria whenever applicable.

A2.35 Protective Coating Monitoring and Maintenance

Program Description

The *Protective Coating Monitoring and Maintenance* AMP is an existing mitigative and condition monitoring program that manages loss of coating integrity of Service Level 1 coatings inside containment. The program maintains and monitors the aging of Service Level I coatings consistent with RG 1.54, "*Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants*". The program consists of guidance for selection, application, inspection, and maintenance of protective coatings.

Maintenance of Service Level I coatings applied to carbon steel and concrete surfaces inside containment (e.g., steel liner, structural steel, supports, penetrations, and concrete walls and floors) serves to prevent or minimize the loss of material of carbon steel components due to corrosion and aids in decontamination, but these coatings are not credited for managing the effects of corrosion for the carbon steel containment liner and components. This program ensures that the Service Level I coatings maintain adhesion so as to not affect the intended function of the emergency core cooling systems suction strainers.

The program also provides controls over the amount of unqualified coatings. Unqualified coating may fail in a way to affect the intended function of the emergency core cooling systems suction strainers. Therefore, the quantity of degraded and unqualified coating is controlled and assessed periodically to ensure that the amount of unqualified coating in the primary containment is kept within acceptable design limits to support the post-accident operability of the emergency core cooling systems.

Enhancements

The *Protective Coating Monitoring and Maintenance* AMP will be enhanced to:

1. Revise procedures to explicitly state peeling and physical damage are considered in the condition assessment.

2. Revise procedures to reference ASTM D-5163-08.

A2.36 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is an existing condition monitoring program that will continue to manage the aging effect of reduced insulation resistance of accessible electrical cable and connection insulation in adverse localized environments within in-scope structures and which could be subject to the environments' applicable aging effects from heat, radiation, and moisture. An adverse localized environment is defined as a condition in a limited plant area that is significantly more severe than the specified service condition for the cable or connection.

At least once every 10 years, accessible insulated cables and connections installed in adverse localized environments are visually inspected for jacket surface anomalies such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination. Surface anomalies are indications that can be visually monitored to preclude the conductor insulation applicable aging effect. As part of the periodic inspections, previously identified and mitigated adverse localized environments' cumulative aging effects applicable to in-scope cable and connection insulation will be reviewed to confirm that the insulation's intended functions continue to be supported during the SPEO.

Proven test(s) applicable to condition monitoring of the insulation are performed if testing is evaluated to be necessary after visual inspections identify degraded or damaged conditions that may adversely affect the performance of cable or connection insulation intended functions.

Further investigation will be performed on cables and connections per the corrective action program when the acceptance criteria is not met. Corrective actions may include, but are not limited to, testing, shielding or otherwise changing the environment, relocating or replacement.

<u>Enhancements</u>

The *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be enhanced to:

1. As part of the periodic inspections, add review of previously identified and mitigated adverse localized environments' cumulative aging effects applicable to in-scope cable and connection insulation to confirm that the insulation's intended functions continue to be supported during the SPEO.

2. Add a description of potential testing and its sampling: If testing is evaluated to be necessary after visual inspections identify degraded or damaged conditions (e.g. unacceptable surface anomalies) that may adversely affect the performance of cable or connection insulation intended functions, then proven test(s) applicable to condition monitoring of the insulation are performed (e.g., thermography may be included). For a large number of cables identified as degraded, a sample population will be tested. The sample size will be 20% of each affected cable and connection type with a maximum sample size of 25. Among the factors to consider for developing the test sample population are cable or connection type, environment, voltage level, circuit loading, and insulation material which is the most important factor per EPRI guidance. Testing as part of an existing maintenance, calibration, or surveillance program may be credited. The basis for the sample selection will be documented.

3. Add acceptance criteria for potential testing of accessible cables and connections with unacceptable visual inspection results to the Oconee AMP description: Test results are to be within the acceptance criteria, as identified in the Oconee procedures.

A2.37 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

Program Description

The *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification (EQ) Requirements Used in Instrumentation Circuits* AMP is a new performance monitoring program that will manage the effects of reduced insulation resistance of non-EQ cable and connection insulation in instrumentation circuits with sensitive, high voltage, low level current signals and that are subjected to adverse localized environments caused by temperature, radiation, or moisture. The program evaluates electrical insulation material for cables and connections subjected to an adverse localized environment at least once every 10 years. The AMP will apply to the in-scope non-EQ portions of circuits in the area radiation monitoring system (e.g. high range containment area radiation monitors) and the neutron flux monitoring nuclear instrumentation system.

Reduced insulation resistance caused by severe degradation in the cable insulation can be detected by periodically reviewing past calibration or surveillance results before losing the cable or connection intended function. Regular calibration or surveillance testing is already performed for in-scope instrumentation circuits. When the non-EQ cables and connections are included as part of the calibration or surveillance circuit, this AMP will periodically review and evaluate the past calibration or surveillance results (since the last review) to identify the existence of cable and connection insulation aging related degradation.

As an alternative to reviewing calibration or surveillance results, or when the non-EQ cables and connections (cable systems) are not included as part of the calibration or surveillance, a proven cable system test will be performed for the in-scope circuits. Such test will be judged effective in detecting deterioration in the cable system insulation.

Industry and plant-specific OE will be considered in the development and implementation of this program.

Enhancements

None

A2.38 Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is an existing condition monitoring program that will continue to manage the aging effect of reduced electrical insulation resistance due to exposure to significant moisture.

This AMP applies to the electrical insulation for inaccessible (e.g., underground in buried conduit, embedded ducts or conduits (e.g. duct banks), trenches, vaults, manholes, or direct-buried) non-EQ medium-voltage power cables (operating voltage of 2 kV to 35 kV) within the scope of the program that are potentially exposed to significant moisture. For this program, significant moisture is defined as exposure to moisture that last more than three days (i.e., long-term wetting or submergence over a continuous period) that if left unmanaged, could potentially lead to a loss of intended function.

Periodic actions are taken to prevent in-scope inaccessible medium-voltage power cables from being exposed to significant moisture. Water collection in accessible trenches (e.g. low-points) and conduit manholes containing in-scope medium-voltage cables and conduit ends is monitored via documented inspections, and the water removed as needed. The inspection frequencies have been established based on Oconee OE over time and do not exceed a one year interval. Inspections and de-watering will also be performed after event-driven occurrences such as heavy rain, rapid thawing of heavy ice and snow, or flooding.

In-scope non-EQ inaccessible medium-voltage cables found to be exposed to significant moisture are tested to detect reduced electrical insulation resistance, an aging-effect indicator of insulation age-related degradation. The cable testing includes one or more proven methods, such as dissipation factor (‘tangent-delta’) or similar power factor, AC voltage withstand, partial discharge, step voltage, time-domain reflectometry, frequency-domain reflectometry, insulation resistance with or without polarization index, or other applicable and effective testing. Cables are tested at least once every 6 years. More frequent testing may occur based on test results and OE.

There are no submarine cables or other cables designed for continuous wetting or submergence currently in the scope of this program. Future installed cables of these potential designs would be considered for inclusion in this program, at least for a one-time test.

Enhancements

The *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be enhanced to:

1. Add inspections for water accumulation performed after event driven occurrences, such as heavy rain, rapid thawing of heavy ice and snow, or flooding.

2. For the periodic water accumulation inspections, add documented verification that either automatic or passive drainage systems or manual pumping are effective in preventing medium-voltage cable exposure to significant moisture.

3. Remove from program descriptions the original ‘significant voltage’ portion of exposures to determine the inaccessible medium-voltage cables for testing.

4. Revise the inaccessible medium-voltage cable testing and water-accumulation inspection matrix to include inspection methods, test methods, and acceptance criteria.

A2.39 Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is a new condition monitoring program that will manage the aging effect of reduced electrical insulation resistance due to exposure to significant moisture.

The AMP will apply to the electrical insulation for inaccessible (e.g., installed underground in buried conduit, cable trenches, cable troughs, duct banks, vaults, manholes, or direct buried) non-EQ instrument and control cables and splices within the scope of SLR that are potentially exposed to significant moisture, including instrument and control cables designed for continuous wetting or submergence. For this program, significant moisture is defined as exposure to moisture that lasts more than three days (i.e., long term wetting or submergence over a continuous period) that if left unmanaged, could potentially lead to a loss of intended function.

Periodic actions will be taken to prevent in-scope inaccessible instrument and control cables from being exposed to significant moisture. Water accumulation in accessible conduit ends, manholes, and trenches (e.g. low points) containing in-scope instrument and control cables will be periodically monitored via documented inspections, and the water removed as needed. The inspection frequencies will be based on Oconee OE with cable wetting or submergence and with water accumulation over time. Inspections and de-watering will be performed at least once annually and after event-driven occurrences such as heavy rain, rapid thawing of heavy ice and snow, or flooding.

Accessible portions (e.g. in manholes) of in-scope inaccessible instrument and control cables will be visually inspected at least once every 6 years, coordinated with the water accumulation inspections, to assess observable jacket age-related degradation that may be indicative of electrical insulation age-related degradation. The inaccessible instrument and control cables that are found to be exposed to significant moisture will be evaluated to determine if testing is required. If testing is needed, then based on cable application and insulation material, one or more type(s) of one-time testing of in-service samples is performed to assess the insulation condition. If testing is required, the specific type of test(s) will be a proven technique capable of detecting reduced insulation resistance of the cable’s insulation system due to wetting or submergence.

Industry and plant-specific OE will be evaluated in the development and implementation of this program.

Enhancements

None

A2.40 Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification (EQ) Requirements* AMP is a new condition monitoring program that will manage the aging effect of reduced electrical insulation resistance due to exposure to significant moisture.

The AMP will apply to the electrical insulation for inaccessible (e.g., installed underground in buried conduit, cable trenches, cable troughs, duct banks, vaults, manholes, or direct buried) non-EQ low voltage power cables and splices (operating voltage less than 2 kV) within the scope of SLR that are potentially exposed to significant moisture, including low voltage power cables designed for continuous wetting or submergence. For this program, significant moisture is defined as exposure to moisture that lasts more than three days (i.e., long-term wetting or submergence over a continuous period) that if left unmanaged, could potentially lead to a loss of intended function.

Periodic actions will be taken to prevent in-scope inaccessible low voltage power cables from being exposed to significant moisture. Water accumulation in accessible conduit ends, manholes, and trenches (e.g. low-points) containing in-scope low voltage power cables will be periodically monitored via documented inspections, and the water removed as needed. The inspection frequencies will be based on Oconee OE with cable wetting or submergence and with water accumulation over time. Inspections and de-watering will be performed at least once annually and after event driven occurrences such as heavy rain, rapid thawing of heavy ice and snow, or flooding.

Accessible portions (e.g. in manholes) of in-scope inaccessible low voltage power cables will be visually inspected at least once every six years, coordinated with the water accumulation inspections, to assess observable jacket age-related degradation that may be indicative of electrical insulation age-related degradation. The inaccessible low voltage power cables that are found to be exposed to significant moisture will be evaluated to determine if testing is required. If testing is needed, then based on cable application and insulation material, one or more type(s) of one-time testing of in-service samples is performed to assess the insulation condition. If testing is required, the specific type of test(s) will be a proven technique capable of detecting reduced insulation resistance of the cable’s insulation system due to wetting or submergence.

Industry and plant-specific OE will be evaluated in the development and implementation of this program.

Enhancements

None

A2.41 Metal Enclosed Bus

Program Description

The *Metal Enclosed Bus* AMP is a new condition monitoring program that will manage the identified aging effects of in-scope metal enclosed bus. The internal portions of the accessible bus enclosure assemblies will be visually inspected for age-related degradation, including cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The accessible bus insulation will be visually inspected for signs of reduced insulation resistance, such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination which may indicate overheating or aging degradation. The accessible internal bus insulating supports will be visually inspected for structural integrity and signs of cracks.

Metal enclosed bus external surfaces and external structural supports are managed by the *Structures Monitoring* (A2.33) AMP.

Accessible elastomers (e.g., gaskets, boots, O-rings and sealants) will be inspected for degradation including surface cracking, crazing, scuffing, dimensional change (e.g., “ballooning” and “necking”), shrinkage, discoloration, hardening or loss of strength.

A sample of accessible bolted connections will be inspected for increased resistance of connection by either performing thermography or measuring the connection resistance using a micro-ohmmeter. In addition to thermography or resistance measurement, accessible bolted connections not covered with heat shrink tape or boots are visually inspected for increased resistance of connection (e.g., loose or corroded bolted connection and hardware including cracked or split washers).

As an alternative to thermography or measuring connection resistance of bolted connections, for accessible bolted connections covered with heat shrink tape, sleeving, insulating boots, etc., insulating material may be visually inspected to detect surface anomalies, such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination.

Industry and plant-specific OE will be considered in the development and implementation of this program.

Enhancements

None

A2.42 Fuse Holders

Program Description

The *Fuse Holders* AMP is a new condition monitoring program. The program applies to fuse holders outside of active devices susceptible to the following aging effects: increased resistance of connection due to chemical contamination, corrosion, and oxidation or fatigue caused by ohmic heating, thermal cycling, electrical transients, frequent removal and replacement, or vibration. The program also manages degradation of electrical insulation for the fuse holders with metallic clamps susceptible to the aging effects identified. Fuse holders inside an active device (e.g. switchgears, power supplies, inverters, battery chargers, and circuit boards) are not within the scope of this program.

The program utilizes visual inspection and testing to identify age-related degradation for both fuse holder electrical insulation material and fuse holder metallic clamps. The specific type of test performed is determined prior to the initial test and is to be a proven test for detecting increased resistance of connection of fuse holder metallic clamps, or other appropriate testing justified in the *Fuse Holders* AMP.

Industry and plant-specific OE will be considered in the development and implementation of this program.

Enhancements

None

A2.43 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The *Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is a new condition monitoring program that will manage the aging effect of increased electrical resistance of electrical cable connections (metallic parts).

This program will perform a one-time test, on a representative sampling basis, to confirm the absence of loosening of connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion and oxidation. The following factors will be considered for sampling: voltage level (medium and low voltage), circuit loading (high load), connection type, and location (high temperature, high humidity, vibration, etc.).

Non-EQ electrical cable connections (metallic parts) associated with cables within the scope of the program will be tested prior to the SPEO to provide an indication of the integrity of the cable connections. The specific type of test to be performed will be determined based on the type of connection and will be a proven method for detecting loose connections, such as thermography, contact resistance testing, or other appropriate testing methods without removing the connection insulation such as heat shrink tape, sleeving, insulating boots, etc.

Twenty percent of a connector type population with a maximum sample size of 25 constitutes a representative connector sample size. Otherwise a technical justification of the methodology and sample size used for selecting components under test will be included as part of the programs documentation.

A sample of cable connections within the scope of the program will be tested on a one-time test basis or at least once every five years if only visual inspection is used to provide an indication of the integrity of the cable connections. Depending on the findings of the one-time test, subsequent testing may be performed within ten years of initial testing. The first visual inspections or tests for SLR are to be completed prior to the SPEO.

As an alternative to testing for accessible cable connections that are covered with heat shrink tape, sleeving, insulating boots, etc., a visual inspection of insulation materials to detect surface anomalies, such as embrittlement, cracking, chipping, melting, discoloration, swelling or surface contamination may be performed. When this alternative visual inspection is used to check cable connections, the inspection will be completed prior to the SPEO, and repeated at least every five years, thereafter. The basis for performing only the alternative visual inspection to monitor age-related degradation of cable connections will be documented.

Industry and plant-specific OE will be considered in the development and implementation of this program.

<u>Enhancements</u>

None

A3.0 SUMMARY DESCRIPTIONS OF TIME-LIMITED AGING ANALYSIS AGING MANAGEMENT PROGRAMS

The NUREG-2191 Chapter X AMPs associated with TLAA are described in the following sections. The AMPs are either consistent with generally accepted industry methods as discussed in NUREG-2191 Chapter X or require enhancements. The following list reflects the status of these programs at the time of the SLRA submittal. Commitments for program additions and enhancements are identified in Appendix A6.0 SLR Commitment List.

A3.1 Fatigue Monitoring

Program Description

The *Fatigue Monitoring* AMP is an existing preventative program that manages fatigue or other types of cyclic loading time limited aging analyses (TLAAs) of the reactor pressure vessel components, reactor coolant pressure boundary piping components, and other components per the acceptance criterion in 10 CFR 54.21(c)(1)(iii). The program monitors and tracks the number of occurrences and severity of design basis transients assessed in the applicable fatigue or cyclic loading analyses, including those in applicable cumulative usage factor (CUF) analyses, environmentally-assisted cumulative usage fatigue (CUF_{en}) analyses, ASME Section III fatigue waiver analyses, and cycle-based flaw growth, flaw tolerance, or fracture mechanics analyses.

The Oconee *Fatigue Monitoring* AMP manages cumulative fatigue damage or cracking induced by fatigue or cyclic loading in the applicable structures and components through performance of activities that monitor one or more relevant analysis parameters, such as CUF values, CUF_{en} values, design transient cycle limit values, or predicted flaw size values. Therefore, the program has two aspects, one to verify the continued acceptability of existing analysis through cycle counting or parameter monitoring and the other to provide periodically updated evaluations of the analysis to demonstrate that they continue to meet the appropriate limits.

Fatigue analyses for these components are based upon explicit numbers and amplitudes of thermal and pressure transients. Oconee UFSAR Table 5-2 and Table 5-23 provide a listing of design transients and associated design cycles. The intent of the design basis transient definitions is to bound a wide range of possible events with varying ranges of severity in temperature and pressure.

The program will continue to monitor transient cycles to ensure that LBB analyses remain valid. There are no locations being tracked for HELB exclusion based on fatigue, therefore the program does not apply to HELB.

The program implements appropriate corrective actions (e.g., reanalysis, component or structure inspections, or component or structure repair or replacement activities) when acceptance limits are approached. The program manages cracking due to fatigue or cyclic loading in accordance with UFSAR Section 5.2.1.4 and Technical Specification Section 5.5.6.

Enhancements

The *Fatigue Monitoring* AMP will be enhanced to:

1. Require monitoring and tracking of transient cycles associated with the ASME Code, Section XI, Appendix L analysis be performed between the inspections for each ASME Code, Section XI, Appendix L locations. Consistent with existing program cycle counting, a surveillance limit will be established to initiate corrective action prior to exceeding transient cycle assumptions in the ASME Code, Section XI, Appendix L analysis.

2. Require periodic validation of chemistry parameters used to determine F_{en} factors used.

3. Expand existing corrective action guidance associated with exceeding a cycle counting surveillance limit to recommend consideration of component repair, component replacement, performance of a more rigorous analysis, performance of an ASME Code, Section XI, Appendix L flaw tolerance analysis, or scope expansion to consider other locations with the highest expected CUF_{en} values.

A3.2 Neutron Fluence Monitoring

Program Description

The *Neutron Fluence Monitoring* AMP is an existing condition monitoring program that manages loss of fracture toughness due to neutron fluence of the reactor pressure vessel regions for which neutron fluence is projected to exceed 1.0E+17 n/cm^2 (E>1MeV) during the SPEO to ensure continued validity of neutron fluence analyses and that applicable reactor pressure vessel neutron irradiation embrittlement analysis (i.e., TLAAs) will remain within their applicable limits. Neutron fluence is a time-dependent input parameter for evaluating reduction of fracture toughness due to neutron irradiation embrittlement. This program monitors the reactor pressure vessel and reactor vessel internals neutron fluence to verify the continued acceptability of existing irradiation embrittlement and related analyses. The components evaluated by these analyses are the reactor pressure vessel shell and welds and reactor vessel internal components subject to reactor coolant and neutron flux environment which are fabricated from carbon or low alloy steel with stainless steel cladding, stainless steel, and nickel alloy materials.

The program has two aspects, one to verify the continued acceptability of existing analyses through neutron fluence monitoring, and the other to provide periodically updated evaluations of the analyses involving neutron fluence inputs to demonstrate that they continue to meet the appropriate limits defined in the CLB.

Monitoring is performed to verify the adequacy of neutron fluence projection methods that are defined for the CLB in NRC approved reports. Cavity dosimetry measurements are used to verify the accuracy of fluence calculations and to determine fluence uncertainty values in accordance with RG 1.190, *"Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence."* For neutron fluence monitoring activities that apply to components located in the beltline region of the reactor pressure vessels, the monitoring methods are performed in a manner consistent with the monitoring methodology guidelines in RG 1.190, *"Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence."* Neutron fluence monitoring methods that are applied to reactor pressure vessel locations outside of the beltline region of the reactor pressure vessels are justified and are consistent with NRC approved methodology. These methods have been benchmarked with both in-vessel and ex-vessel cavity dosimetry for the beltline region.

Neutron Fluence Monitoring AMP results are compared to the neutron fluence parameter inputs used in the neutron embrittlement analyses for reactor pressure vessel components. This includes, but is not limited to, the neutron fluence inputs for the reactor pressure vessel upper-shelf energy analyses and equivalent margin analyses, pressure-temperature analyses, and low temperature overpressure protection (LTOP) that are required to be performed in accordance in 10 CFR Part 50, Appendix G requirements, and safety analyses that are performed to demonstrate adequate protection of the reactor pressure vessels against the consequences of pressurized thermal shock (PTS) events, as required by 10 CFR 50.61 and applicable to the CLB. Comparisons to the neutron fluence inputs for other analyses (as applicable to the CLB) includes those for RT_{NDT}.

Reactor vessel surveillance capsule dosimetry data obtained in accordance with 10 CFR Part 50, Appendix H requirements and through implementation of the *Reactor Vessel Material Surveillance* AMP (A2.19) provides inputs to and have impacts on the neutron fluence monitoring results that are tracked by this program. In addition, regulatory requirements in the plant technical specifications or in specific regulations of 10 CFR Part 50 apply, including those in 10 CFR Part 50, Appendix G; 10 CFR 50.55a; and the PTS requirements in 10 CFR 50.61, as applicable for the CLB.

Cavity dosimetry measurements are used to verify the accuracy of fluence calculations and to determine fluence uncertainty values. These calculations and related uncertainties determine when the neutron fluence is projected to exceed 1.0E+17 n/cm^2 (E > 1 MeV) for specific reactor vessel items during the SPEO and thus require monitoring to ensure their embrittlement analyses remain below applicable limits. While no additional in-vessel dosimetry is planned, Oconee utilizes cavity dosimetry for Unit 2 as a continuous fluence monitoring device. Cavity dosimetry measurements provide continued experimental data to verify the accuracy of fluence calculations and to determine fluence uncertainty values. Ex-vessel cavity dosimetry is used to monitor neutron fluence because the Oconee units do not currently have in-vessel surveillance capsules. Only the Oconee Unit 2 reactor vessel has installed cavity dosimetry. However, the Oconee Unit 1 and ONS Unit 3 reactor vessel fluence uncertainty values are based on Oconee Unit 2 cavity dosimetry results due to similar design, fabrication, operation, and fuel loading patterns. The use of the Oconee Unit 2 cavity dosimetry for Oconee Unit 1 and Oconee Unit 3 was approved by the NRC in a letter to Duke Power Company dated December 5, 1988 [Reference D. B. Matthews (NRC) letter dated December 5, 1988 to H.B. Tucker (Duke), Subject: "Cavity Dosimetry Program - Oconee Nuclear Station Units 1, 2, and 3", ADAMS Accession Number ML16152A761].

Verification of the uncertainty in assumed reactor vessel fluence values is performed on a cycle-by-cycle basis to ensure neutron fluence projections remain bounding with respect to actual plant operating conditions. The verification is accomplished by performing a review of key reactor vessel fluence input parameters to ensure that any significant changes would be evaluated.

Enhancements

None

A3.3 Environmental Qualification of Electric Equipment

Program Description

The *Environmental Qualification (EQ) of Electric Equipment* AMP is an existing program that manages the qualified life and TLAA analyses of electrical components that are important to safety as defined in 10 CFR 50.49. An aging limit (qualified life) is established for equipment within the program scope and appropriate actions are taken prior to or at the end of the equipment qualified life such that the aging limit is not exceeded. Changes to material activation energy values as part of the reanalysis are justified. The program establishes, demonstrates and documents the qualification level, configuration, maintenance, surveillance and replacement requirements necessary to maintain the qualification conclusions and equipment qualified life.

Enhancements

The *Environmental Qualification of Electric Equipment* AMP will be enhanced to:

1. Add activities to perform visual inspections of accessible, passive EQ electric equipment located in adverse localized environments at least once every 10 years.

2. Establish acceptance criteria for the visual inspection of accessible passive EQ electric equipment located in adverse localized environments.

A3.4 Concrete Containment Unbonded Tendon Prestress

Program Description

The *Concrete Containment Unbonded Tendon Prestress* AMP is an existing program that is part of ONS containment inservice inspection program, which is based on ASME Section XI, Subsection IWL criteria, as supplemented by the requirements of 10 CFR 50.55a(b)(2)(viii). The program monitors and assesses the adequacy of the prestressing force for each tendon group based on type (i.e., hoop, vertical, dome, inverted-U, helical) and other considerations (e.g., geometric dimensions, whether affected by repair/replacement, etc.). The program ensures, during each inspection, that the trend lines of the measured prestressing forces remain above the minimum required value before the next scheduled inspections. Otherwise, corrective actions are taken to ensure containment prestress adequacy. Acceptance criteria follow 10 CFR 50.55a, ASME Code Section XI (Subsection IWL) and include construction of trend lines consistent with NRC Information Notice (IN) 99-10, "*Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments*." RG 1.35.1, "*Determining Prestressing Forces for*

Inspection of Prestressed Concrete Containments," provides guidance for calculating prestressing losses and predicted forces. The program incorporates plant-specific and industry OE.

Enhancements

None

A4.0 SUMMARY DESCRIPTIONS OF TIME-LIMITED AGING ANALYSES EVALUATION

As part of the application for a renewed license, 10 CFR 54.21(c) requires that an evaluation of TLAAs for the SPEO be provided. The TLAAs identified and evaluated to meet these requirements are discussed below.

A4.1 Identification and Evaluation of Time-Limited Aging Analyses

10 CFR 54.21(c)(2) requires that an evaluation of TLAA be provided as part of the application for a renewed operating license. TLAA are defined in 10 CFR 54.3(a) and are evaluated in accordance with 10 CFR 54.21(c)(1).

Additionally, 10 CFR 54.21(c)(2) requires that the application include a list of plant specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based upon TLAAs as defined in 10 CFR 54.3. It also requires an evaluation that justifies the continuation of these exemptions for the SPEO. No plant-specific exemptions granted pursuant to 10 CFR 50.12 were identified for Oconee that are based upon a TLAA. Therefore, no further evaluation is required for plant-specific exemptions granted pursuant to 10 CFR 50.12.

The following TLAAs have been identified and evaluated to meet 10 CFR 54.21(c) requirements. Summaries of the TLAAs applicable to the SPEO are included in the following sections:

- Reactor Vessel Neutron Embrittlement Analysis (A4.2)
- Metal Fatigue (A4.3)
- Environmental Qualification of Electric Equipment (A4.4)
- Concrete Containment Tendon Prestress (A4.5)
- Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis (A4.6)
- Other Plant-Specific Time Limited Aging Analyses (A4.7)

A4.2 Reactor Vessel Neutron Embrittlement Analysis

10 CFR 50.60 requires that all light water reactors meet the fracture toughness, pressure-temperature limits, and materials surveillance program requirements for the reactor coolant pressure boundary as set forth in 10 CFR 50, Appendices G and H. The ONS *Reactor Vessel Material Surveillance* AMP (A2.19), in combination with the ONS *Neutron Fluence Monitoring* AMP (A3.2) will ensure that the TLAA requirements of 10 CFR 50 Appendix G and 10 CFR 50.61 remain valid through the SPEO. The ferritic materials of the reactor vessel are subject to embrittlement due to high energy (E > 1.0 MeV) neutron exposure. Embrittlement means the material has lower toughness (i.e., will absorb less strain energy during a crack or rupture), thus allowing a crack to propagate more easily under thermal and pressure loading. Neutron embrittlement analyses are used to account for the reduction in fracture toughness associated with the cumulative neutron fluence (total number of neutrons that intersect a square centimeter of component area during the life of the plant). Since these neutron embrittlement analyses are

calculated based on plant life, they are identified as TLAAs. The following RPV neutron embrittlement TLAAs have been identified and evaluated to meet 10 CFR 54.21(c) requirements:

- Neutron Fluence Projections
- Upper-Shelf Energy
- Pressurized Thermal Shock
- Pressure Temperature Limits
- Low Temperature Overpressure Protection

A4.2.1 Neutron Fluence Projections

The calculation based fluence analysis methodology contained in BAW-2241P-A, Revision 2 is used to predict the 80-year fluence at reactor vessel shell locations.The BAW-2241P-A, Revision 2 fluence analysis methodology was developed through a full-scale benchmark experiment that was performed at the Davis Besse reactor. The analyses methodologies used to calculate the Units 1, 2, and 3 reactor vessel fluence satisfy the guidance set forth in RG 1.190, *"Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence."* For the Oconee Nuclear Station, neutron transport calculations, using the methodology from BAW-2241P-A, Revision 2, were completed for Cycles 27-29 for ONS Unit 1, Cycles 25-28 for ONS Unit 2, and Cycles 26-28 for ONS Unit 3, and used to project fast neutron fluence at the reactor vessel shell (i.e., traditional and extended beltline locations) to 72 EFPY. The fluence analyses have been projected to the end of the SPEO and are dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A4.2.2 Upper Shelf Energy

Appendix G of 10 CFR 50, Appendix G (Reference 4.2-11), requires that reactor vessel beltline materials "have Charpy upper-shelf energy in the transverse direction for base metal and along the weld for weld material according to the ASME Code, of no less than 75 ft-lb (102 J) initially and must maintain Charpy upper-shelf energy throughout the life of the vessel of no less than 50 ft-lb (68 J) unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation or Director, Office of New Reactors, as appropriate, that lower values of Charpy upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code."

For SLR, the upper-shelf energy values for the traditional beltline and extended beltline materials were determined for the ONS reactor vessel traditional and extended beltline items using methods consistent with RG 1.99, Revision 2. Two methods may be used to predict the decrease in upper-shelf energy with irradiation, depending on the availability of credible surveillance capsule data as defined in RG 1.99, Revision 2. For vessel beltline materials that are not in the surveillance program or for locations with non-credible data, the Charpy upper-shelf energy is assumed to decrease as a function of fluence and copper content, as indicated in RG 1.99, Revision 2 (Position 1.2). When two or more credible surveillance data sets are available from the reactor, they may be used to determine the Charpy upper-shelf energy of the surveillance material. The surveillance data are then used in conjunction with the regulatory guide to predict the change in upper-shelf energy of the reactor vessel material due to irradiation (Position 2.2).

The 72 EFPY RG 1.99, Revision 2 (Position 1.2) upper-shelf energy values of the vessel materials are predicted using the corresponding ¼T fluence projection, copper content of the materials, and Figure 2 in RG 1.99, Revision 2. The predicted Position 2.2 upper-shelf energy values are determined for the reactor vessel materials that are contained in the surveillance program by using surveillance data along with the corresponding ¼T fluence projection. The ¼T fluence projections are ¼T displacement per atom adjusted values unless the attenuation of fluence from the inside wetted surface using RG 1.99, Revision 2, Equation (3), exceed the ¼T displacement per atom adjusted values. The projected upper-shelf energy values were calculated to determine if the Oconee Unit 1, Unit 2, and Unit 3 traditional and extended beltline materials remain above the 50 ft-lb limit at 72 EFPY.

All ONS Unit 1 reactor vessel traditional and extended beltline plate and forging materials maintain an upper-shelf energy value greater than 50 ft-lbs at 72 EFPY. All ONS Unit 1 reactor vessel traditional and extended beltline Linde 80 welds have upper-shelf energy values less than 50 ft-lbs at 72 EFPY and require an equivalent margins analysis to demonstrate that lower values of Charpy upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

All ONS Unit 2 reactor vessel traditional and extended beltline forging materials maintain an upper-shelf energy value greater than 50 ft-lbs at 72 EFPY. All ONS Unit 2 reactor vessel traditional and extended beltline Linde 80 welds have upper-shelf energy values less than 50 ft-lbs at 72 EFPY and require an equivalent margins analysis to demonstrate that lower values of Charpy upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

All ONS Unit 3 reactor vessel traditional and extended beltline forging materials maintain an upper-shelf energy value greater than 50 ft-lbs at 72 EFPY with the exception of the reactor vessel inlet and outlet nozzle forgings and the transition forging. All reactor vessel traditional and extended beltline Linde 80 welds have upper-shelf energy values less than 50 ft-lbs at 72 EFPY. The reactor vessel inlet and outlet nozzle forgings, transition forging, and traditional beltline and extended beltline Linde 80 welds require an equivalent margins analysis to demonstrate that lower values of Charpy upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

Detailed equivalent margins analyses were performed on the required components described for each Oconee unit. In each case a demonstration was provided to support the projection of the ONS Units 1, 2, and 3 USE analyses to the end of the subsequent period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A4.2.3 Pressurized Thermal Shock

10 CFR 50.61 provides rules for fracture toughness requirements for protection against pressurized thermal shock events for pressurized water reactors. 10 CFR 50.61(b)(2)

establishes screening criteria for RT_{PTS} as 270°F for plates, forgings, and longitudinal welds and 300°F for circumferential welds. All the traditional and extended beltline materials in Oconee Units 1, 2, and 3 are below the RT_{PTS} screening criteria values of 270°F for base metal and longitudinal welds, and 300°F for circumferentially oriented welds through the SPEO. The Oconee Units 1, 2, and 3 PTS analyses for traditional and extended beltline locations have been projected to the end of the SPEO and are dispositioned in accordance with 10 CFR 54.21(c)(ii).

A4.2.4 Pressure-Temperature Limits

10 CFR 50 Appendix G requires that the reactor vessel be maintained within established pressure-temperature limits, including heatup and cooldown operations. These limits specify the maximum allowable pressure as a function of reactor coolant temperature. As the reactor vessel is exposed to increased neutron irradiation, its fracture toughness is reduced. The pressure-temperature limits must account for the anticipated reactor vessel fluence.

Duke Energy prepared 72 EFPY (equivalent to 80 years of operation) pressure-temperature limits to demonstrate that the predicted operating window is sufficient to conduct heatups and cooldowns. The 72 EFPY pressure-temperature limits were developed with consideration of traditional and extended beltline materials using the analytical methods and flaw acceptance criteria of topical report BAW-10046A, Revision 2 and ASME Code Section XI, Appendix G (2013 Edition, which permits use of K_{Ic}). It was confirmed that all three Oconee Units will have sufficient operating windows to conduct heatups and cooldowns at 72 EFPY.

The ONS *Reactor Vessel Material Surveillance* AMP (A2.19), ONS *Neutron Fluence Monitoring* AMP (A3.2), and plant Technical Specifications will ensure that updated pressure-temperature limits will be submitted to the NRC for approval prior to exceeding the period of applicability for Units 1, 2, and 3. Since the pressure-temperature limits will be updated through the 10 CFR 50.90 process at a later, more appropriate date, the effects of aging on the intended function(s) of the reactor vessels will be adequately managed for the SPEO and are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A4.2.5 Low Temperature Overpressure Protection

Low temperature overpressure protection systems at Oconee Units 1, 2, and 3 are required by Technical Specification Limited Condition for Operation 3.4.12. A pressurizer power operated relief valve provides the automatic relief capability during the design basis mass input and the design basis heat input transients to automatically prevent the reactor coolant system pressure from exceeding the pressure-temperature limit curves based on 10 CFR 50, Appendix G.

The low temperature overpressure enable temperature has been determined for 72 EFPY in accordance with the requirements of ASME Section XI, Appendix G and is 269.2°F for ONS-1, and 307°F for Units 2 and 3, which are below the current Technical Specification requirement of 325°F.

The ONS *Reactor Vessel Material Surveillance* AMP (A2.19), ONS *Neutron Fluence Monitoring* AMP (A3.2), and plant Technical Specifications will ensure that updated low temperature overpressure enable temperature and power operated relief valve setpoint will be submitted to the NRC for approval prior to exceeding the period of applicability for Units 1, 2, and 3. Since the low temperature overpressure enable temperature, power operated relief valve setpoint will be updated through the 10 CFR 50.90 process at a later, appropriate date, the effects of aging on the intended function(s) of the Oconee reactor vessels will be adequately managed for the SPEO and are dispositioned in accordance with 10 CFR 50.54(c)(1)(iii).

A4.3 Metal Fatigue

Fatigue analyses are required on components designed to ASME Code, Section III, Class 1 and USAS (ANSI) B31.7. In addition, certain other codes such as ASME Section III, Class 2 and 3, USAS (ANSI) B31.1, and ASME Section VIII may require a fatigue analysis or assume a stated number of full range thermal and displacement transient cycles. NUREG-2192 also provides examples of components that are likely to have fatigue TLAAs within the current licensing basis that would require evaluation for the subsequent period of extended operation. Searches were performed to identify these and any other potential fatigue TLAAs within the current licensing bases for Oconee Units 1, 2, and 3. Those that are identified as Oconee fatigue TLAAs are evaluated using 80-year transient cycle and cumulative usage projections. The TLAA dispositions are described in the following subsections:

- Transient Cycle Projections for 80 years (A4.3.1)
- Class 1 Fatigue Analysis (including fatigue waivers) (A4.3.2)
- Non-Class 1 Fatigue Analysis (A4.3.3)
- Environmentally-Assisted Fatigue (A4.3.4)
- Analytical Evaluation of Flaws (A4.3.5)
- Weld Overlay Class 1 Fatigue Analysis (A4.3.6)

A4.3.1 Transient Cycle Projections for 80 Years

Fatigue analyses are based upon numbers and amplitudes of thermal and pressure transients. UFSAR Tables 5-2, *"Transient Cycles for RCS Components Except Pressurizer Surge Line"* and UFSAR Table 5-23, *"Operating Design Transient Cycles for Pressurizer Surge Line"* list the design transients and associated design cycles. The intent of the design basis transient definitions is to bound a wide range of possible events with the varying ranges of severity in temperature and pressure. CLB fatigue analyses are based upon the original number of design cycles that have been previously projected to bound 60 years of service. For SLR, the original number of design cycles now been projected to bound 80 years of service. Since the fatigue analyses are based upon the number of cycles, the fatigue analyses discussed in the following sections are considered TLAAs. In order to ensure the design cycles remain bounding in the safety class 1 fatigue analyses, the *Fatigue Monitoring* AMP (A3.1) tracks cycles for significant fatigue transients and ensures corrective action is taken prior to potentially exceeding fatigue design limits.

A4.3.2 Class 1 Fatigue Analysis

Class 1 fatigue analyses were originally performed in accordance with the ASME Code, Section III for reactor coolant system vessels supplied by B&W, USAS B31.7, Class I for B&W supplied piping, and USAS B31.7, Class II for Bechtel supplied piping in ancillary systems attached to B&W supplied components and extending to the first outboard isolation valve. In accordance with the Oconee UFSAR, Section 3.2.2.2, reactor coolant system Class 1 piping (USAS B31.7 Class I and II) was redesigned to the 1983 ASME Section III Code during the steam generator replacement project. The reactor coolant pump casings were designed, fabricated, inspected and tested to meet the intent of the ASME Boiler and Pressure Vessel Code, Section III, for Class A vessels, but are not code stamped. The specific Oconee reactor coolant system component design codes are reported in the Oconee UFSAR, Table 5-4. Each Class 1 fatigue analysis must demonstrate that the cumulative usage factor for the component will not exceed the Code design limit of 1.0 when the component is exposed to all postulated normal and upset design transients.

During the initial LR period, several changes occurred that potentially impact the SLR TLAA evaluation for the reactor coolant system Class 1 components. For example, the following changes have been considered.

- Reactor vessel closure head replacement in 2003-2004 (ONS Units 1, 2, and 3)
- Steam generator replacement 2003-2004 (ONS 1, 2, and 3)
- Alloy 600 primary water stress corrosion cracking mitigation including nozzle repair and/or full structural weld overlay for pressurizer nozzles, pressurizer spray, and pressurizer safety/relief nozzles, both surge line nozzles and the reactor coolant system branch attached piping.
- Measurement uncertainty recapture (ONS 1, 2, and 3)

The following Class 1 components were assessed for impact of 80-year projected cycles on fatigue design:

- Reactor vessel
- Reactor vessel internals
- Once through steam generators
- Reactor coolant pumps
- Pressurizer
- Control rod drive mechanism
- Reactor coolant system piping and connected lines
- Pressurizer surge line

In addition, a detailed fatigue evaluation is not required if Class 1 components conform to the waiver of fatigue requirements per ASME Code, Section III. These fatigue waivers depend on the numbers of anticipated transients over the life of the plant and therefore constitute TLAAs. The original design cycles were postulated to bound 80 years of plant operations. Therefore, the fatigue analyses and fatigue waivers are postulated to remain valid for the subsequent period of extended operation.

In order to ensure the design cycles remain bounding in the fatigue analyses and fatigue waivers, the *Fatigue Monitoring* AMP (A3.1) will track cycles for significant fatigue transients listed in UFSAR Tables 5-2, *"Transient Cycles for RCS Components Except Pressurizer Surge Line"* and UFSAR Table 5-23, *"Operating Design Transient Cycles for Pressurizer Surge Line,"* and ensure corrective action is taken prior to potentially exceeding fatigue design limits. The effects of fatigue on the Class 1 components will be adequately managed by the *Fatigue Monitoring* AMP (A3.1) for the SPEO in accordance with 10 CFR 54.21(c)(1)(iii).

A4.3.3 Non-Class 1 Piping Fatigue Analysis

For the Oconee non-Class 1 mechanical systems within the scope of SLR, only the piping components have been explicitly designed to consider thermal transient cycle count assumptions that must be revalidated for the extended period of operation. These piping systems are designed to ANSI B31.7 Class II and Class III and ANSI B31.1 requirements where a stress range reduction factor is used based on the number of expected thermal cycles during the period of plant operation. If the total number of expected thermal cycles for a piping system is less than 7,000, then a stress range reduction factor of 1.0 is applied. If the total number of expected thermal cycles for a piping system is greater than 7,000, a stress range reduction factor less than 1.0 is applied to reduce the alternating stress range in the piping design. From review of the design basis and projected 80 year cycles, no portions of non-Class 1 piping exceed the allowable number of thermal cycles. The stress range reduction factors applied to the non-Class 1 piping systems design will remain valid for the extended period of operation in accordance with 10 CFR 54.21 (c)(1)(ii).

A4.3.4 Environmentally-Assisted Fatigue (EAF)

As outlined in Section X.M1 of NUREG-2191 and Section 4.3 of NUREG-2192 the effects of the reactor water environment on cumulative usage factor must be examined for a set of sample critical components for the plant. This sample set includes the locations identified in NUREG/CR-6260, *"Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components"* and additional plant-specific component locations in the reactor coolant pressure boundary if they may be more limiting than those considered in NUREG/CR-6260. These additional limiting locations are identified through an environmental fatigue screening evaluation. The environmentally assisted fatigue screening process made use of existing fatigue usage values for the ASME Code, Section III components. The environmentally assisted fatigue screening evaluation reviewed the CLB fatigue evaluations for all ASME Code, Section III reactor coolant pressure boundary components and piping and ANSI B31.7 piping, including the NUREG/CR-6260 locations, to determine the lead indicator (also referred to as sentinel) locations for environmentally assisted fatigue. As a result of the environmentally assisted fatigue screening evaluation, there were other locations found that could potentially be more limiting than the NUREG/CR-6260 locations.

Calculations were prepared to document the evaluations of environmentally assisted fatigue for ASME Code, Section III pressure boundary components and piping and ANSI B31.7 piping that contact the reactor coolant and determine fatigue sensitive locations for comparison and ranking. These evaluations are for SLR purposes and do not amend the existing design reports. The effects of fatigue on the intended function(s) of ASME Code, Section III pressure boundary components and piping and ANSI B31.7 piping that contact reactor coolant will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) and the *ASME Section XI Inservice Inspection, Subsection IWB, IWC, and IWD* AMP (B2.1.1) through the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A4.3.5 Analytical Evaluation of Flaws

The ASME Section XI ISI requirements that involve analytical evaluation of flaws are contained in Subsection IWB for Class 1 pressure retaining components. ISI at Oconee has, in a number of instances, lead to the identification of crack-like indications (primarily in welds). For these indications detected during ISI that exceed acceptance standards in Subsection IWB (1) repairs may be made, (2) affected portions of the component may be replaced, or (3) the flaw may be shown to be acceptable through analytical evaluation.

Acceptance through analytical evaluation requires a prediction of crack growth until the next inspection or the end of service lifetime of the component. Indications that are determined not to grow beyond an acceptable limit during the projected lifetime of the component are justified for continued operation. These crack growth analyses involve the same design thermal transient cycle assumptions considered in the original design. Because the crack growth rate determined by these analyses may further limit the design life of the components, a review of the analyses that were completed to the end of service lifetime of the component are TLAA and must be evaluated to demonstrate acceptability for 80 years of operation.

For SLR, the existing Class 1 flaws were catalogued and have been evaluated against the thermal cycles projected for 80 years. The results of the evaluation show that Class 1 fracture mechanics flaw calculations will remain valid for the SPEO. In order to ensure the design cycles remain bounding in these calculations, the *Fatigue Monitoring* AMP (Section A3.1) will track cycles for significant fatigue transients listed in UFSAR Tables 5-2, *"Transient Cycles for RCS Components Except Pressurizer Surge Line"* and UFSAR Table 5-23, *"Operating Design Transient Cycles for Pressurizer Surge Line,"* and ensure corrective action is taken prior to potentially exceeding cycle limits used in these calculations. The effects of fatigue on flaws analyzed for Class 1 components will be adequately managed by the *Fatigue Monitoring* AMP (Section A3.1) for the SPEO in accordance with 10 CFR 54.21(c)(1)(iii).

A4.3.6 Weld Overlay Class 1 Fatigue Analysis

Structural weld overlays were installed on the pressurizer spray, pressurizer surge, reactor coolant system hot leg surge, reactor coolant system letdown, hot leg decay heat and safety and relief nozzles to eliminate concerns with stress corrosion cracking of Alloy 600. Analyses of the weld overlays for these locations includes both fatigue analyses and postulated flaw growth analyses.

The transient cycles considered in the weld overlays were projected for 80 years of operation and were found to have adequate margin in order to remain valid for the SPEO. The Fatigue Monitoring AMP (B3.1) will track cycles for significant fatigue transients and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

A review of the fatigue flaw growth analyses established the required time frame for inspection of the associated weld overlays. Specifically, 25% sample population of the weld overlays will be inspected for cracking during the SPEO. The examinations will be performed in accordance with the rules outlined in Code Case N-770-5, Item F-1. These inspections will be managed by the ASME Section XI Inservice Inspection, Subsection IWB, IWC, and IWD AMP (B2.1.1).

The effects of fatigue on the intended function(s) of the weld overlays will be adequately managed by the Fatigue Monitoring aging management program (B3.1) and the ASME Section XI Inservice Inspection, Subsection IWB, IWC, and IWD aging management program (B2.1.1) through the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A4.4 Environmental Qualification of Electric Equipment

Thermal, radiation, and cyclical aging analyses of plant electrical and I&C components, developed to meet 10 CFR 50.49 requirements, have been identified as TLAAs. The NRC nuclear station EQ requirements in 10 CFR 50.49 require that an EQ program be established to demonstrate that certain electrical equipment located in harsh plant environments is qualified to perform applicable safety functions in those harsh environments after the effects of inservice aging. Harsh environments are defined as those areas of the plant that could be subject to the harsh environmental effects of a LOCA, HELB, and post-LOCA radiation. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of EQ. The various aspects of design for environmental considerations are described in Oconee UFSAR 3.11 *Environmental Design of Mechanical and Electrical Equipment*.

The EQ program was evaluated against the Division of Operating Reactors (DOR), “Guidelines for Evaluating Qualification of Class 1E Electrical Equipment in Operating Reactors”, Inspection and Enforcement Bulletin (IEB) 79-01B, “Environmental Qualification of Class 1E Equipment”, and IEEE Standard 323-1974, “IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations,” as codified by 10 CFR 50.49. IEEE 323-1974 provides the criteria for safety related equipment (electrical “Class 1E” equipment) and the basis for categorizing equipment important to safety, and defines environmental service conditions.

Reanalysis of an aging evaluation to extend the qualified life of equipment is performed on a routine basis as part of the EQ program. Important attributes for the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met).

If the qualified life cannot be extended by reanalysis, the equipment must be refurbished, replaced, or requalified prior to exceeding the period for which the current qualification remains valid. A reanalysis is to be performed in a timely manner such that sufficient time is available to refurbish, replace, or requalify the equipment if the reanalysis is unsuccessful.

The implementation of the enhanced EQ AMP provides reasonable assurance that thermal, radiation, and cyclical aging effects will be adequately managed so that the intended functions of components within the scope of LR will be maintained during the SPEO.

The *Environmental Qualification of Electric Equipment* program (A3.3) will manage the effects of aging for EQ equipment through the SPEO in accordance with 10 CFR 50.49(c)(1)(iii). The program meets the requirements of 10 CFR 50.49 for the applicable electrical equipment important to safety.

A4.5 Concrete Containment Unbonded Tendon Prestress

The Oconee containment buildings are post-tensioned, reinforced concrete structures composed of vertical cylinder walls and a shallow dome, supported on a conventional reinforced concrete base slab. The cylinder wall is prestressed by 176 vertical tendons anchored at the top surface of the upper ring girder at the top of the concrete cylinder and at the bottom of the foundation slab and six groups of 105 hoop tendons plus two additional tendons enclosing 120° of arc for a total of 632 tendons anchored at the six vertical buttresses. The dome is prestressed by three groups of 54 tendons oriented at 120° to each other for a total of 162 tendons anchored at the vertical face of the upper ring girder. Each tendon consists of 90 wires bundled together.

Over time, the containment prestressing forces decrease due to relaxation of the steel tendons and due to creep and shrinkage of the concrete. The containment tendon prestressing forces were calculated during the original design considering the magnitude of the tendon relaxation and concrete creep and shrinkage over the 40-year life of the plant. Oconee UFSAR Section 18.3.3, Containment Inservice Inspection Plan describes the performance of periodic surveillances of individual tendon prestressing values. Predicted lower limit force values are calculated for each tendon prior to the surveillances to estimate the magnitude of the tendon relaxation and concrete creep and shrinkage for the given surveillance period. The prestressing forces are measured and plotted, and trend lines are developed, to ensure the average tendon group prestressing values remain above the respective minimum required values until the next scheduled surveillance. The predicted lower limit force values and regression analyses, utilizing actual measured tendon forces, are used to evaluate the acceptability of the containment structure to perform its intended function over the current 60-year life of the plant, and therefore, are TLAAs requiring evaluation for the SPEO.

For SLR, predicted lower limit lines and trend lines of measured prestressing forces have been established for applicable tendon groups through the SPEO. The predicted final effective preload at the end of 80 years exceeds the minimum required preload for all containment tendons. Consequently, the post- tensioning system will continue to perform its intended function throughout the SPEO. The *Concrete Containment Unbonded Tendon Prestress* AMP (A3.4) and *ASME Section XI, Subsection IWL* AMP (A2.29) will monitor and manage the associated loss of tendon prestressing forces during the SPEO in accordance with 10 CFR 54.21(c)(1)(iii).

A4.6 Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis

A4.6.1 Containment Liner Plate

The interior surface of the containments for ONS Units 1, 2, and 3 are lined with a ¼” thick welded steel plate to provide an essentially leak-tight barrier. At all penetrations, the liner plate is thickened to reduce stress concentrations. As described in UFSAR 3.8.1.5.3 *Liner Plate*, the only portions of the liner plate that contain fatigue analysis are those thickened portions at the penetrations. The containment penetration fatigue analysis is contained in Section 4.6.3.

The associated temperature and pressure changes from reactor coolant system heatups and cooldowns and Type A integrated leak rate test are the main contributors to fatigue of the containment liner plate. Combining the total number of cycles for outdoor temperature variations, the total number of Type A tests, and the projected heatups and cooldowns would result in a transient cycle count less than 500 cycles. Therefore, it is concluded that thermal fatigue of the containment liner would be acceptable for the SPEO. The effects of fatigue of the containment liner plate will be adequately managed by the *Fatigue Monitoring* AMP (B3.1) for the SPEO in accordance with 10 CFR 54.21(c)(1)(iii).

A4.6.2 Metal Containment

Not applicable

A4.6.3 Containment Penetrations Fatigue Analysis

The interior surface of the containment is lined with welded steel plate to provide an essentially leak tight barrier. At all penetrations, the liner plate is thickened to reduce stress concentrations of the liner plate. ONS Units 1, 2 and 3 process lines that penetrate the primary containment and experience significant thermal expansion and contraction are solidly anchored to the containment wall. These high temperature lines penetrating the containment wall and liner plate are the main steam and feedwater lines.

The transient cycles considered in the main steam and feedwater penetrations analyses were projected for 80 years of operation and the count found to be adequate for the SPEO. The *Fatigue Monitoring* (A3.1) aging management program will monitor and manage fatigue of the main steam and feedwater penetrations during the SPEO in accordance with 10 CFR 54.21(c)(1)(iii).

A4.7 Other Plant-Specific Time-Limited Aging Analyses

A4.7.1 Reactor Vessel Internals

A4.7.1.1 Reduction in Fracture Toughness Due to Neutron Embrittlement

Framatome Topical Report BAW-10008, Part 1, Revision 1 documents the acceptability of the reactor vessel internals under LOCA and a combination of LOCA and seismic loadings. The effect of irradiation on the material properties and deformation limits for the internals is evaluated with a conclusion that at the end of 40 years the internals will have adequate ductility to absorb local strain at the regions of maximum stress intensity, and that irradiation will not adversely affect deformation limits.

Using the findings from this report, a plant specific evaluation of reactor vessel internals irradiation embrittlement was completed by Oconee in 2012 to address this issue for 60 years.

The NRC staff review of this 60-year evaluation concluded that the licensee had projected the neutron fluence for the reactor vessel Internals using an acceptable methodology consistent with RG 1.190. For subsequent license renewal, reduction in fracture toughness due to neutron embrittlement of the reactor vessel internals relative to the evaluation of BAW-10008, Part 1, Revision 1 must be evaluated for 80 years.

Each reactor vessel Internals item addressed in BAW-10008, Part 1, Revision 1 is assessed in accordance with one of three process steps (i.e., Categories 1-3) for Faulted Conditions to determine if each reactor vessel Internals item should be considered potentially susceptible to an unacceptable amount of reduction of ductility at 72 EFPY. This multi-step assessment was completed for the Oconee reactor vessel internals. Based on the assessments, the effect of irradiation on the material properties and deformation limits of the reactor vessel Internals at all three units at Oconee is acceptable for an 72 EFPY lifetime such that the internals will have adequate ductility to absorb local strain at the regions of maximum stress intensity, and that irradiation will not adversely affect deformation limits under faulted condition loadings for the SPEO. The analyses reported in BAW-10008, Part 1, Revision 1, remain valid for the subsequent period of extended operation and are managed by the PWR Vessel Internals Program (B2.1.7, GALL-SLR XI.M16A), in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the current licensing basis.

A4.7.1.2 Reactor Vessel Internals Flow Induced Vibration Endurance Limits

The reactor vessel internals flow-induced vibration endurance limit assumptions for 60-years were reviewed and updated for applicability to 80-years. The rationale and methods that are applied to SLR for 80-years are identical to those previously established for 60-years and augmented with additional justification to conservatively address environmental assisted fatigue affects utilizing the environmental assisted fatigue criteria developed in NUREG/CR-6909, Revision 1. In addition, the more limiting fatigue curves published in the 2013 edition of the ASME Section III code (compared to the 1986 edition used with the ONS LRA for 60 years) were used in the evaluation.

Flow-induced vibration of the reactor vessel internals was evaluated. The item with the maximum flow-induced vibration stress, and thus the least margin has a stress value that is smaller than the allowable cyclic stress. Therefore, a safety factor exists between the maximum flow-induced vibration stress and the allowable cyclic stress from the fatigue curve for this limiting location. Since this stress is below the endurance limit, the maximum fatigue usage factor associated with flow-induced vibration for the reactor vessel Internals is below the endurance limit for an 80-year life. The reactor vessel internals flow-induced vibration endurance limits will not be exceeded during the SPEO in accordance with 10 CFR 54.21(c)(1)(ii).

A4.7.1.3 Reactor Vessel Internals Irradiation Embrittlement

Framatome Topical Report BAW-10008, Part 1, Revision 1, discussed further in Section 4.7.1.1, documents the acceptability of the reactor vessel Internals under LOCA and a combination of LOCA and seismic loadings for 40 years. Using the findings from this report, a plant-specific evaluation of reactor vessel internals irradiation embrittlement was completed by Oconee in 2012 to address this issue for 60 years. The NRC staff review of this 60-year evaluation concluded that the licensee had projected the neutron fluence for the reactor vessel Internals using an acceptable methodology consistent with RG 1.190. For SLR, neutron fluence of the reactor vessel Internals relative to the evaluation of BAW-10008, Part 1, Revision 1 must be evaluated for 80 years. In addition, a reactor vessel internals functionality assessment of inaccessible components (MRP-227-A/LAI #6), is identified as a TLAA for SLR. Duke Energy resolved this issue for 60 years through Framatome report ANP-3477P.

The projected 72 EFPY fluence values (determined to be equivalent to 80 years) developed for the update of BAW-10008, Part 1, Revision 1 (Section 4.7.1.1) were developed based on extrapolation of 60-year reactor vessel Internals transport calculations that were developed using the RG 1.190 compliant methodology (i.e., deterministic DORT 3-D synthesis methods) developed for the reactor vessel as described in BAW-2241PA, Revision 0. These values are consistent with the fluence estimates reported in MRP-189, Revision 3. Since the BAW-2241PA methodology is mainly concerned with reactor vessel fluence, some specific modeling enhancements were required in order to accurately represent the reactor vessel Internals components.

To meet the requirements of the *Neutron Fluence Monitoring* AMP (A3.2), a reactor vessel internals fluence analysis was completed. A single analysis was prepared to represent all three units, since they all have similar design, fabrication, operation, and fuel loading patterns. From this analysis, the effect of irradiation on the material properties and deformation limits of the reactor vessel Internals at all three units at Oconee was determined to be acceptable for a 72 EFPY lifetime. The reactor vessel internals functionality assessment of inaccessible components (MRP-227-A/LAI #6) will be addressed for 80 years through the *PWR Vessel Internals* (A2.7) AMP. The reactor vessel internals will have adequate ductility to absorb local strain at the regions of maximum stress intensity, and irradiation will not adversely affect deformation limits under faulted condition loadings during the SPEO in accordance with 10 CFR 54.21(c)(1)(ii).

A4.7.2 Reactor Vessel Underclad Cracking

Underclad cracking refers to intergranular separations in the heat affected zones of low alloy base metal under austenitic stainless steel cladding in SA-508, Class 2 reactor vessel forgings manufactured to a coarse grain practice, and clad by high-heat-input submerged arc processes. BAW-10013 contains a fracture mechanics analysis that demonstrates the critical crack size required to initiate fast fracture is several orders of magnitude greater than the assumed maximum flaw size plus predicted flaw growth due to design fatigue cycles. The flaw growth analysis was performed for a 40-year cyclic loading, and an end-of-life assessment of radiation embrittlement (i.e., fluence at 32 EFPY) was used to determine fracture toughness properties. The report concluded that the intergranular separations found in B&W vessels would not lead to vessel failure. This report was accepted by the Atomic Energy Commission (AEC).

In May 1973, RG 1.43, *"Control of Stainless Steel Weld Cladding of Low-Alloy Steel Components"* was issued. The guide states that intergranular separation has been reported only in forgings and plate material of SA-508 Class 2 composition made to coarse grain practice when clad using high-deposition-rate welding processes identified as 'high-heat-input' processes such as the submerged-arc wide-strip and the submerged-arc 6-wire processes. Cracking was not observed in clad SA-508 Class 2 materials clad by 'low-heat-input' processes controlled to minimize heating of the base metal. Further, cracking was not observed in clad SA-533 Grade B Class 1 plate material, which is produced to fine grain practice. Characteristically, the cracking occurs only in the grain-coarsened region of the base-metal heat-affected zone at the weld bead overlap. The guide also notes that the maximum observed dimensions of these subsurface cracks is 0.5 inch long × 0.165 inch deep.

The methodology used to evaluate intergranular separations for the ONS reactor vessels at 80 years is consistent with the methodology reported in the update of BAW-10013 included as Appendix C of BAW-2251A. An Oconee specific analysis was performed for 72 EFPY and MUR conditions using current fracture toughness information, applied stress intensity factor solutions, fatigue crack growth correlations for SA-508 Class 2 materials, and is evaluated in accordance with the methodology prescribed in ASME Section XI, 2013 Edition, IWB-3612.

The analysis was applied to five regions of the reactor vessel: flange top, nozzle belt, shell taper, shell, and transition forging. Since the closure head for each ONS unit has been replaced, and the replacement closure head is not susceptible to UCC, the closure heads were not re-evaluated. Both axial and circumferential oriented flaws were considered in the evaluation. All significant normal and upset condition transients and emergency and faulted condition transients were evaluated in the analysis. The fatigue crack growth analysis considered all the normal and upset condition transients with associated design cycles (80-year design cycles are equivalent to 40- and 60-year design cycles) for the SPEO.

The lowest fracture toughness margin for Level A/B (normal/upset) loading conditions is 3.94 and occurs at the flange top location for the axially oriented flaw, which is higher than the minimum required margin of 3.16 ($\sqrt{10} = 3.16$). The lowest fracture toughness margin for Level C/D (emergency/faulted) loading condition is 1.62 and occurs at the shell taper region due to a circumferentially oriented flaw, which is greater than the minimum required margin of 1.41 ($\sqrt{2} = 1.41$). Therefore, postulated flaws for the underclad cracking in the reactor vessels for all the three Oconee Units remain acceptable at the end of the 72 EFPY service evaluation period.

For the ONS Unit 1, Unit 2, and Unit 3, reactor vessel shells, including the transition forging, nozzle belt and flange, the reactor pressure vessel underclad cracking TLAA have been projected to the end of the subsequent period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A4.7.3 Reactor Coolant Pump Flywheel Fatigue Analysis

Oconee UFSAR Section 5.4.4.2, Flywheel Design Consideration, identified the potential for fatigue crack initiation in the reactor coolant pump motor flywheel bore keyway should a certain threshold of reactor coolant pump motor starts be exceeded. The flywheel has been designed for 10,000 starts. Comparison of the design value to actual and predicted pump starts over 80 years was identified as a TLAA. The SLR evaluation resulted in a total count of 480 projected reactor coolant pump starts after 80 years of operation. This number is based on extrapolating 19 years of reactor coolant pump start data from 2000 to 2019, and then doubling it to demonstrate conservatism and account for future startup variations from unit trips and shutdowns. Since the flywheel is designed for 10,000 starts, the results of this evaluation indicate a safety factor of over 20.

The reactor coolant pump flywheel fatigue analysis TLAA remains valid through the SPEO in accordance with the requirements of 10 CFR 54.21(c)(1)(ii).

A4.7.4 Leak Before Break

The successful application of Leak-Before-Break (LBB) to the Oconee Reactor Coolant System main coolant piping is described in B&WOG topical report entitled, “The B&W Owners Group Leak-Before-Break Evaluation of Margins Against Full Break for RCS Primary Piping of B&W Designed NSSS,” BAW-1847, Revision 1, September 1985. This report provides the technical basis for evaluating postulated flaw growth in the main Reactor Coolant System piping under normal plus faulted loading conditions and was approved by the NRC for the current term of operation. The time-limited aging analyses in BAW-1847, Revision 1, include fatigue flaw growth and the qualitative assessment of thermal aging of cast austenitic stainless steel reactor coolant pump inlet and outlet nozzles.

Fatigue flaw growth evaluations are based on transient definitions defined by the reactor coolant system design specification. The original transient cycles that were defined for 40 years of operation are compared to the projected cycles for 80 years. The comparison indicates that none of the original 40-year transient cycles are projected to be exceeded for 80 years. The transient cycles will be monitored and management by the *Fatigue Monitoring* AMP (A3.1) for the SPEO.

The cast austenitic stainless steel reactor coolant pump inlet and outlet nozzles are susceptible to thermal aging. Thermal aging of cast austenitic stainless steel causes a reduction of fracture toughness. Reduction of fracture toughness of the reactor coolant pump nozzles has been determined to be acceptable for the PEO through a flaw stability analysis. The generic LBB analysis for the B&W operating plants reported in BAW-1847, Revision 1, remains valid for the SPEO in accordance with 10 CFR 54.21(c)(1)(i) for the ONS. Reduction of fracture toughness of the reactor coolant pump discharge and suction nozzles was determined to be acceptable for SPEO based on the update to the flaw stability analysis described above. Although the LBB analysis remains valid, the transient cycles will be monitored and management by the *Fatigue Monitoring* AMP (A3.1) provides additional assurance for the SPEO.

A4.7.5 Crane Load Cycle Limit

A review of design specifications for cranes within the scope of subsequent license renewal was performed to identify those cranes that were designed or otherwise required to meet the intent of Crane Manufacturers Association of America (CMAA) Specification 70-1975, “Specifications for Electric Overhead Traveling Cranes,” and, therefore, have a defined service life as measured in load cycles.

CMAA Specification 70 presents the bounding combinations of the number of load cycles and mean effective load factors for each service class. These define the acceptable service limits for the TLAA. The plant response to NUREG-0612, as guided by NRC Generic Letter 81-07, “Control of Heavy Loads,” indicates that the cranes designed and fabricated in accordance with Electric Overhead Crane Institute (EOCI) Specification 61, “Specifications for Electric Overhead Traveling Cranes”, and compares that design approach to that of CMAA Specification 70, which has superseded EOCI Specification 61. The conclusion reached in the response to NRC Generic

Letter 81-07 is that the: 1) reactor building polar cranes: 2) spent fuel pool cranes; 3) spent fuel pool auxiliary cranes; 4) pump aisle crane; 5) turbine aisle crane; 6) turbine aisle auxiliary crane; and 7) heater bay crane satisfy the design intent of CMAA Specification 70.

Based on the comparison of service classes described in the original design specification (EOCI Specification 61) to CMAA Specification 70, the applicable service class is Class A. CMAA Specification 70 states that a range of load cycles from 20,000 to 100,000 was considered for cranes in Class A (Standby) service thus establishing the envelope for acceptable number of load cycles for this TLAA. The total projected load cycles for the reactor building polar cranes, spent fuel pool cranes, spent fuel pool auxiliary cranes, pump aisle crane, turbine aisle crane, turbine aisle auxiliary crane, and heater bay crane have been demonstrated to remain valid through the SPEO in accordance with the requirements of 10 CFR 54.21(c)(1)(i).

Load Handling System	CMAA Service Class	Maximum Number of Load Cycles	Projected Number of Load cycles for 80 Years
Unit 1 Reactor Building Polar Crane	A	100,000	1,752
Unit 2 Reactor Building Polar Crane	A	100,000	1,752
Unit 3 Reactor Building Polar Crane	A	100,000	1,752
Unit 1/2 Spent Fuel Pool Crane	A	100,000	3,316
Unit 3 Spent Fuel Pool Crane	A	100,000	2,658
Unit 1/2 Spent Fuel Auxiliary Crane	A	100,000	1,880
Unit 3 Spent Fuel Auxiliary Crane	A	100,000	940
Turbine Building Pump Isle Crane	A	100,000	3,820
Turbine Isle Crane	A	100,000	6,992
Turbine Isle Auxiliary Crane	A	100,000	6,992
Heater Bay Crane	A	100,000	3,525

A5.0 PLANT-SPECIFIC AGING MANAGEMENT PROGRAMS

This section provides summaries of a plant-specific program credited for managing the effects of aging.

A5.1 Secondary Shield Wall Tendon Surveillance

Program Description

The *Secondary Shield Wall Tendon Surveillance* AMP is an existing condition monitoring program that manages aging effects associated with the tendons and tendon anchorage in the reactor building secondary shield wall. The secondary shield wall tendon system assures the structural adequacy of the secondary concrete shield wall, which provides structural support, shelter and protection to safety related SSCs. There are no preventive or mitigative actions associated with this program. The program manages for loss of material, cracking, and loss of tendon prestress by conducting visual inspections and tendon lift-off tests in accordance with station procedures. These are performed on three randomly selected horizontal tendons every other outage. Acceptance criteria outlined in station specifications and procedures ensures appropriate corrective actions are taken based on the observed and/or measured conditions. If an inspection identifies a degraded condition associated with a tendon or the tendon anchorage, the corrective action program is utilized to facilitate repair or replacement activities.

Enhancements

The *Secondary Shield Wall Tendon Surveillance* AMP will be enhanced to:

1. Enhance station procedures to include a review of previous visual inspection and lift-off data results for the tendons selected for inspection.

A6.0 SUBSEQUENT LICENSE RENEWAL COMMITMENTS LIST

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
1	*ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program	The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP is an existing program that will be enhanced to: 1. Revise procedures to require inspections to be performed for components associated with sentinel locations assessed under ASME Code, Section XI, Non-Mandatory Appendix L for the following: • Reactor coolant system pressurizer surge line piping (hot leg elbow). • High pressure injection piping, stop valve-to-check valve (usage bounds high pressure injection nozzle).	B2.1.1	Program enhancements for SLR will be implemented six months prior to the SPEO.
2	*Water Chemistry* program	The existing *Water Chemistry* program is credited.	B2.1.2	Ongoing
3	*Reactor Head Closure Stud Bolting* program	The *Reactor Head Closure Stud Bolting* AMP is an existing program that will be enhanced to: 1. Revise procurement requirements for reactor head closure stud bolting to incorporate guidance from RG 1.65, Revision 1 and NUREG-2191, Chapter XI.M3, to ensure newly procured bolting material does not exceed the limit for maximum measured yield strength of 150 ksi and ultimate tensile strength of 170 ksi.	B2.1.3	Program enhancements for SLR will be implemented six months prior to the SPEO.
4	*Boric Acid Corrosion* program	The existing *Boric Acid Corrosion* program is credited.	B2.1.4	Ongoing
5	*Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components* program	The existing *Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components* program is credited.	B2.1.5	Ongoing

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
6	*Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* program	The *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* program is a new condition monitoring program that will provide assurance that the reactor coolant pressure boundary cast austenitic stainless steel components (i.e., pump casings) with the potential for significant thermal aging embrittlement meet their intended functions. Industry and plant-specific OE will be considered in the development and implementation of this program.	B2.1.6	Program will be implemented six months prior to the SPEO.
7	*PWR Vessel Internals* program	The *PWR Vessel Internals* AMP is an existing program that will be enhanced as follows: 1. The *PWR Vessel Internals* AMP will be updated as necessary to provide guidance for implementing the changes to primary and expansion items in MRP-227, Rev 1-A, Tables 4-1, 4-4 (and Table 5-1 for Element 6 only), as modified by the ONS gap analysis reported in Appendix B2.1.7. (Elements 4 and 6)	B2.1.7	Program enhancements for SLR will be implemented six months prior to the SPEO.
8	*Flow-Accelerated Corrosion* program	The *Flow-Accelerated Corrosion* AMP is an existing program that will be enhanced to reassess infrequently used piping systems excluded from the scope of the program to ensure adequate bases exist to justify this exclusion for the SPEO.	B2.1.8	Program enhancements for SLR will be implemented six months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
9	*Bolting Integrity* program	The *Bolting Integrity* AMP is an existing program that will be enhanced to: 1. Revise applicable procedures and specifications to include reference to EPRI Report 1015336, EPRI Report 1015337, and NUREG-1339, as appropriate. 2. Revise procedures governing the direct visual examination of bolted joints to include inspection parameters such as lighting, distance, and offset. 3. Perform volumetric inspections of non-ASME high strength bolting greater than 2 inches in diameter in accordance with the method described in ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1. 4. Perform visual inspections of a representative sample of 20 percent of closure bolting where leakage is difficult to detect such as submerged connections or systems containing air/gas or a maximum of 17 bolts for each material and environment population per unit, whichever is less, during each ten year period. If the minimum sample size is not achieved during a ten year period, then alternative inspections may be performed. For submerged bolting, alternative inspections may include (a) diver inspections or (b) remote video inspections. For systems containing air/gas, alternative inspections may include (a) visual inspection for discoloration when leakage from inside the piping system would discolor the external surfaces of the component; (b) monitoring and trending of pressure decay when the bolted connection is located within an isolated boundary; (c) soap bubble testing on the external mating surface of the bolted component; or (d) thermography, when the temperature of the process fluid is higher than ambient conditions around the component.	B2.1.9	Program enhancements for SLR will be implemented six months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		5. Perform additional inspections of a minimum of 20 percent of similar bolting or five additional inspections, whichever is less, when sample based inspections do not meet acceptance criteria. If the additional inspections identify bolting that does not meet acceptance criteria, then an extent of condition and extent of cause analysis will be conducted to determine the further extent of inspections. Additional inspections of similar bolting will be performed at all three units and will occur within the same interval in which the original inspection was conducted. The corrective action program will be used to determine if changes to inspection frequency is appropriate if any inspection results indicate that loss of function will occur prior to the next scheduled inspection.		
10	*Steam Generators* program	The existing *Steam Generators* program is credited.	B2.1.10	Ongoing

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
11	*Open-Cycle Cooling Water* program	The *Open-Cycle Cooling Water System* AMP is an existing program that will be enhanced to: 1. Perform periodic inspection, cleaning, and eddy current testing of the 'A' and 'B' Chiller condensers at least once every five years. 2. Perform a minimum of 20 inspections for recurring internal corrosion in raw water systems every 24 months until the rate of recurring internal corrosion occurrences no longer meets the criteria for recurring internal corrosion as defined in Section 3.3.2.2.7 of NUREG-2192. The selected inspection locations will be periodically reviewed to validate their relevance and usefulness and adjusted as appropriate. Evaluation of the inspection results will include (1) a comparison to the nominal wall thickness or previous wall thickness measurements to determine rate of corrosion degradation; (2) a comparison to the design minimum allowable wall thickness to determine the acceptability of the component for continued use; and (3) a determination of reinspection interval.	B2.1.11	Program enhancements for SLR will be implemented six months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		3. Perform periodic internal visual inspections of the visible portion of the supply and return piping to the radwaste equipment cooling system from the condenser circulating water system intake piping in conjunction with the performance of the intake piping internal coating inspections. Visual inspections will be performed to identify direct evidence of internal degradation and indirect evidence of through wall leakage including the presence of backfill material or gravel within the pipe. 4. Provide additional guidance in procedures for inspections of non-ASME Code components for items such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes. 5. Provide additional guidance for trending of heat exchanger inspection results to evaluate the adequacy of inspection frequencies. 6. If inspections identify wall-thickness below the minimum required wall thickness and the cause of the aging effect for each applicable material and environment is not corrected by repair or replacement for all components constructed of the same material and exposed to the same environment, additional inspections will be conducted. The number of increased inspections is determined in accordance with the corrective action program; however, no fewer than five additional inspections will be conducted for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination is inspected, whichever is less. The additional inspections include inspections at all of the units with the same material, environment, and aging effect combination. 7. Incorporate programmatic guidance contained in engineering support documents into controlled plant procedures subject to administrative controls in accordance with the Duke Energy QA program.		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
12	*Closed Treated Water Systems* program	The *Closed Treated Water Systems* AMP is an existing program that will be enhanced to: 1. Perform condition monitoring using techniques (visual, surface, or volumetric) capable of detecting loss of material, cracking, and fouling as appropriate. Perform visual inspections for loss of material and fouling whenever the system boundaries of the closed treated water systems are opened. Perform surface or volumetric examinations when susceptible materials are inspected for cracking. 2. In each ten year period during the SPEO, perform sufficient number of inspections to ensure that the minimum representative sample of 20% of the population up to 17 inspections per unit is met. A population is defined as components having the same material, water treatment program and aging effect combination. Perform inspections on those components that are more likely to be susceptible to aging based on time in service and severity of operating conditions. 3. Perform additional inspections when inspections do not meet acceptance criteria. Perform at least 5 additional inspections for every inspection not meeting acceptance criteria or 20% of each applicable material, environment, and aging effect combination, whichever is less. 4. Provide additional guidance in procedures for inspections of non-ASME code components for items such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes. 5. Where practical, project the rate of any degradation until the next scheduled inspection or the end of the SPEO (whichever is shorter). Adjust the sampling bases (e.g., selection, size, frequency) as necessary based on the projections.	B2.1.12	Program enhancements for SLR will be implemented six months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		6. If subsequent inspections identify aging effects, the corrective action program will be used to determine the extent of condition and extent of cause to determine further extent of inspections. Perform additional inspections on all units with the same material, environment, and aging effect combinations and within the interval of the original inspection (e.g., refueling outage interval, ten year inspection interval).		
13	*Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* program	The *Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* AMP is an existing program that will be enhanced to: 1. Provide additional procedural guidance to include visual inspections looking for deformation and cracking of bridges, structural members, and structural components. 2. Provide additional procedural guidance to specify bolted connections are monitored for loss of material, cracking, loose or missing bolts or nuts, and other conditions indicative of loss of preload. 3. Include evaluation of findings according to ASME B30.2 or other applicable ASME B30 series in applicable procedures. 4. Enhance maintenance procedures to ensure repairs are performed in accordance with ASME B30.2 or other applicable ASME B30 series in addition to manufacturers literature as necessary.	B2.1.13	Program enhancements for SLR will be implemented six months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
14	*Compressed Air Monitoring* program	The *Compressed Air Monitoring* AMP is an existing program that will be enhanced to perform opportunistic visual inspections of select component internal surfaces exposed to a dry air environment for signs of loss of material due to corrosion. Inspections will be performed by station personnel who have been qualified to the task per approved training procedures and programs. Acceptance criteria will ensure that internal surfaces that show signs of corrosion, that could indicate the potential loss of function of the component, are identified. The program will require corrective actions to be taken if loss of material due to corrosion is identified on internal surfaces of components.	B2.1.14	Program enhancements for SLR will be implemented six months prior to the SPEO.
15	*Fire Protection* program	The *Fire Protection* AMP is an existing program that will be enhanced to perform periodic visual inspection every 18 months for identification of corrosion that may lead to loss of material on the external surfaces of the standby shutdown facility CO_2 fire protection system.	B2.1.15	Program enhancements for SLR will be implemented six months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
16	*Fire Water System* program	The *Fire Water System* AMP is an existing program that will be enhanced to: 1. Perform internal visual inspections of deluge system piping by removing a hydraulically remote nozzle to identify internal corrosion, foreign material, and obstructions to flow. Internal visual inspections will be performed in 50 percent of the deluge systems within the scope of the *Fire Water System* AMP that are not subject to flow testing every five years. During the subsequent five year inspection period, the alternate systems will be inspected such that piping in 100 percent of the deluge systems within the scope of the program is inspected every ten years. Follow-up volumetric wall thickness examinations will be performed if internal visual inspections detect an unexpected level of degradation due to corrosion and corrosion product deposition. 2. Prior to 50 years in service, sprinkler heads will be submitted for field-service testing by a recognized testing laboratory consistent with NFPA 25, 2011 Edition, Section 5.3.1. 3. Perform a one-time volumetric wall thickness inspection on a representative sample deluge system supply piping that is periodically subjected to flow during functional testing. 4. Perform an obstruction investigation in accordance with NFPA 25, 2011 Edition, Section 14.3 if evidence of unacceptable internal flow blockage that could result in failure of system function is identified during internal inspections. When unacceptable internal flow blockage is detected, corrective actions will include removal of the material, an extent of condition determination, review for increased inspections, follow-up examinations, and a flush in accordance with NFPA 25 Annex D.5, *Flushing Procedures*.	B2.1.16	Program enhancements for SLR will be implemented 6 months prior to the SPEO. Inspections or tests that are to be completed prior to SPEO are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		5. Revise inspection procedures to provide additional inspection guidance regarding age-related degradation and to include inspection parameters for items such as lighting, distance, offset, presence of protective coatings, and cleaning processes. 6. Perform flow testing of at least one hose station in each building every five years to demonstrate the capability to provide the design pressure at required flow. Flow testing will be performed at the hydraulically most remote hose station, or if an alternative hose station is tested, the acceptance criteria for the test will account for the additional head loss that would occur if the hydraulically most remote hose station were tested such that the results of the flow test are representative of the limiting location. If acceptance criteria are not met, at least two additional tests shall be performed within five years. If subsequent tests do not meet acceptance criteria, an extent of condition and extent of cause analysis is conducted to determine the further extent of tests. The additional tests include at least one test at one of the other units with the same material, environment, and aging effect combination. 7. Perform external visual inspections of the elevated water storage tank in accordance with Section 9.2.5.5 of NFPA 25, 2011 Edition at least once every two years. 8. Perform flushing of the mainline strainers following system actuation in accordance with Section 10.2.7 of NFPA 25, 2011 Edition.		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		9. Perform main drain testing of the deluge system risers at least once every two years. Main drain testing of deluge systems will be performed in accordance with the procedure described Sections 13.2.5 and A.13.2.5 of NFPA 25, 2011 Edition. When there is a ten percent reduction in full flow pressure when compared to the original acceptance test or previously performed tests, the cause of the reduction shall be identified and corrected if necessary. If acceptance criteria are not met, at least two additional tests shall be performed within two years. If subsequent tests do not meet acceptance criteria, an extent of condition and extent of cause analysis is conducted to determine the further extent of tests. The additional tests include at least one test at one of the other units with the same material, environment, and aging effect combination. 10. Acceptance criteria and corrective actions for internal inspections of the elevated water storage tank will be in accordance with the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers and Tanks* program. Tank wall thickness measurements will be conducted if interior pitting or general corrosion (beyond minor surface rust) is detected.		
17	*Outdoor and Large Atmospheric Metallic Storage Tanks* program	The *Outdoor and Large Atmospheric Metallic Storage Tanks* AMP is a new condition monitoring program that manages loss of material on the external surfaces of the Unit 1,2 and 3 borated water storage tanks and ensures there is no significant degradation of the tank bottoms. These are indoor large volume tanks that contain water and are designed with internal pressures approximating atmospheric that are sited on concrete. This program includes preventive measures to mitigate corrosion by protecting the external surfaces of the steel components in accordance with standard industry practices.	B2.1.17	The program for SLR will be implemented six months prior to the SPEO or no later than the last refueling outage prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
18	*Fuel Oil Chemistry* program	The *Fuel Oil Chemistry* AMP is an existing program that will be enhanced to: 1. Monitor the standby shutdown facility fuel oil day tank quarterly for the presence of water by draining oil from the bottom of the tank and remove the water, if found. 2. Monitor the fuel oil stored in the standby shutdown facility fuel oil day tank quarterly for the presence of bacteria and fungus. 3. Perform volumetric wall thickness measurement of the standby shutdown facility fuel oil day tank if evidence of degradation is identified visually during the 10 year internal inspection.	B2.1.18	Program enhancements for SLR will be implemented six months prior to the SPEO or no later than the last refueling outage prior to the SPEO.
19	*Reactor Vessel Material Surveillance* program	The existing *Reactor Vessel Material Surveillance* AMP is credited.	B2.1.19	Ongoing
20	*One-Time Inspection* program	The *One-Time Inspection* AMP is a new condition monitoring program consisting of a one-time inspection of selected components to verify: a. the system wide effectiveness of an AMP that is designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the SPEO; b. the insignificance of an aging effect; and c. the long-term loss of material that will not cause a loss of intended function for steel components exposed to environments that do not include corrosion inhibitors as a preventive action. Industry and plant specific OE will be considered in the development and implementation of the program.	B2.1.20	Program will be implemented and inspections begin 10 years before the SPEO. Inspections that are to be completed prior to the SPEO are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
21	*Selective Leaching* program	The *Selective Leaching* AMP is a new condition monitoring program that will monitor components constructed of materials which are susceptible to selective leaching. The *Selective Leaching* program includes a one-time inspection for susceptible components exposed to closed-cycle cooling water and treated water environments, as well as opportunistic and periodic inspections for susceptible components exposed to raw water, waste water, and soil (which may include groundwater) environments. Industry and plant-specific OE will be considered in the development and implementation of this program.	B2.1.21	Program will be implemented no later than 10 years prior to the SPEO. The one-time inspections and initial periodic inspections are required to be performed within the 10 years prior to the SPEO, and no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
22	*ASME Code Class 1 Small-Bore Piping* program	The *ASME Code Class 1 Small-Bore Piping* AMP is a new condition monitoring program that augments the existing ASME Code, Section XI requirements and is applicable to ASME Code Class 1 small-bore piping and systems with a nominal pipe size diameter less than four inches and greater than or equal to one inch. This program provides for volumetric examination of a sample of full penetration (butt) welds and partial penetration (socket) welds in Class 1 piping to manage cracking due to stress corrosion cracking or thermal or vibratory fatigue loading. Volumetric examinations will employ techniques that have been demonstrated to be capable of detecting flaws and discontinuities in the examination volume of interest. The extent and schedule for volumetric examination is based on plant-specific OE and whether actions have been implemented that effectively mitigate the cause(s) of any past cracking. The program provides for periodic inspection of a sample of the population of welds (butt welds or socket welds) that have experienced cracking and have not implemented corrective actions to effectively mitigate the cause(s) of the cracking. Industry and plant-specific OE will be considered in the development and implementation of this program.	B2.1.22	Program will be implemented within the 6 years prior to the SPEO. The one-time inspections and initial periodic inspections will be performed within the 6 years prior to the SPEO. These inspections will be completed no later than 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO. Subsequent periodic inspections will be performed every 10 years during the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
23	*External Surfaces Monitoring of Mechanical Components* program	The *External Surfaces Monitoring of Mechanical Components* AMP is a new condition monitoring program that will manage the aging effects of: • loss of material, cracking, and reduction of heat transfer of metallic components; • hardening or loss of strength, loss of material, and cracking or blistering of polymeric components; • hardening or loss of strength, and loss of material of elastomeric components; • loss of material, cracking, and loss of preload for HVAC closure bolting; and • reduced thermal insulation resistance. Periodic visual inspections, not to exceed a refueling outage interval, of metallic, polymeric, and elastomeric components, and insulation metallic jacketing (or protective outer layer if metal jacketing is not used) will be conducted. Industry and plant-specific OE will be considered in the development and implementation of this program.	B2.1.23	The program for SLR will be implemented six months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
24	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* program	The *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* AMP is a new condition monitoring program that will manage loss of material and cracking of metallic components, as well as loss of material, cracking, blistering, hardening and loss of strength of polymeric and elastomeric materials. The program also manages loss of coating integrity for certain components that do not perform a pressure boundary intended function and where loss of coating integrity would not impact the intended functions of downstream components. Reduction of heat transfer and flow blockage will also be managed. This program will consist of visual inspections of all accessible internal surfaces of piping, piping components, ducting, heat exchanger components, polymeric and elastomeric components, and other mechanical components. Periodic visual (VT-1) or surface examinations will be performed to detect cracking of stainless steel components exposed to a diesel exhaust, potable raw water, and waste water and in copper alloys exposed to waste water. Industry and plant-specific OE will be considered in the development and implementation of this program.	B2.1.24	The program for SLR will be implemented six months prior to the SPEO.
25	*Lubricating Oil Analysis* program	The *Lubricating Oil Analysis* AMP is an existing program that will be enhanced to update procedures to specify that in all cases, phase-separated water in any amount is not acceptable.	B2.1.25	Program enhancements for SLR will be implemented six months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
26	*Buried and Underground Piping and Tanks* program	The *Buried and Underground Piping and Tanks* AMP is an existing program that will be enhanced to: 1. Install a cathodic protection system in accordance with NACE SP0169-2007 for buried carbon steel piping within the scope of this program. 2. Complete a modification to abandon the buried copper alloy instrument air system piping within the scope of this program. 3. Annual cathodic protection system monitoring will be performed with a maximum grace period of two months. The system will be monitored at least once during each calendar year. 4. Utilize an inspection method that has been demonstrated to be capable of detecting cracking for uncoated stainless steel piping and when visual inspections of coated stainless steel piping detect coating degradation or damage which could potentially result in stress corrosion cracking of the base material. Indications of cracking will be evaluated in accordance with applicable codes and plant-specific design criteria. 5. Perform wall thickness measurement if visual inspections identify evidence of corrosion beyond minor surface rusting for both coated and uncoated metallic piping or tanks. The results of the wall thickness measurement will be used to calculate a corrosion rate and project wall thickness through the end of the SPEO. If the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material is extrapolated to the end of the SPEO, then additional inspections will be performed as follows: When measured pipe wall thickness, projected to the end of the SPEO,	B2.1.26	Program enhancements for SLR will be implemented and inspections begin 10 years before the SPEO and inspections required during the 10 year interval prior to the SPEO will be completed no later than 6 months prior to the SPEO. The cathodic protection system for buried steel piping will be installed no later than 5 years prior to the SPEO. Modification to abandon the buried copper alloy instrument air system piping will be implemented no later than 6 months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		does not meet the minimum pipe wall thickness requirements due to external corrosion, the number of inspections within the affected piping category will be doubled or increased by five, whichever is smaller. If adverse indications are found in the expanded sample, an extent of condition and extent of cause analysis to determine the further extent of inspections. Timing of any additional inspections will be based on the severity of the identified degradation and the consequences of leakage or loss of function. Any additional inspections will be performed within the same 10-year inspection interval in which the original degradation was identified, or within four years after the end of the 10-year interval if the degradation was identified in the latter half of the 10-year interval. Expansion of sample size may be limited by the extent of piping subject to the observed degradation mechanism or if the piping system or portion of the system is replaced or otherwise mitigated within the same 10-year inspection interval in which the original degradation was identified or within four years after the end of the 10-year interval, if the degradation was identified in the latter half of the 10-year interval. 6. Perform inspections of buried steel condenser circulating water system piping at least once every ten years. The minimum number of inspections will be determined based on the effectiveness of preventive actions in accordance with NUREG-2191, Table XI.M41-2. Ten linear feet of piping will be exposed for each inspection. Inspections of the large diameter condenser circulating water system intake piping will expose a quadrant (i.e., 9 to 12 o'clock or 12 to 3 o'clock) of the piping. External inspections of the large diameter condenser circulating water system intake piping will be supplemented by low frequency		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		electromagnetic testing performed from the internal surface of the same section of piping that is externally inspected with follow-up ultrasonic wall thickness measurements performed of areas identified as low points during low frequency electromagnetic testing. 7. Perform visual inspections of at least two ten-linear foot sections of buried uncoated stainless steel piping at least once every ten years. Piping inspection locations will be selected based on risk (i.e., susceptibility to degradation and consequences of failure). 8. Perform visual inspections of at least four ten linear foot sections of underground coated steel piping at least once every ten years. Piping inspection locations will be selected based on risk (i.e., susceptibility to degradation and consequences of failure). 9. Internal volumetric inspections of the standby shutdown facility diesel engine fuel oil tank will cover at least 25% of the surface area of the tank and include at least some of both the top and bottom of the tank. 10. Personnel performing inspections of buried coated piping and tanks will either: 1) possess an Association for Materials Protection and Performance coating inspector program level 2 or level 3 inspector qualification, 2) complete the EPRI *Comprehensive Coatings Course* and complete the EPRI *Buried Pipe Condition Assessment and Repair Training Computed Based Training Course*, or 3) be qualified as a coatings specialist in accordance with ASTM D7108.		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		11. If significant coating damage is identified during visual inspections, then perform an evaluation to determine if the coating damage was caused by nonconforming backfill. If it is determined that the coating damage was caused by nonconforming backfill, then conduct an extent of condition evaluation to determine the extent of degraded backfill in the vicinity of the observed damage.		
27	*Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* program	The *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* AMP is a new condition monitoring program that manages degradation of internal coatings/linings exposed to raw water, treated water, treated borated water, or lubricating oil that can lead to loss of material of base metals or downstream effects such as reduction in flow, pressure, or heat transfer when coatings/ linings become debris. Industry and plant-specific OE will be considered in the development and implementation of this program.	B2.1.27	Program will be implemented no later than 10 years prior to the SPEO. Baseline inspections that may be required in the 10 year period prior to the SPEO will be completed no later than six months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
28	*ASME Section XI, Subsection IWE* program	The *ASME Section XI, Subsection IWE* AMP is an existing program that will be enhanced to: 1. Specify that for "high strength" structural bolting consisting of ASTM A325, ASTM F1852, and/or ASTM A490 bolts, the preventive actions for storage, lubrication, and stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for Structural Connections) publication "*Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts*", will be used. 2. Include inspection attributes for the aging mechanisms listed in NUREG-2191. For non-coated surfaces this includes evidence of cracking, discoloration, wear, pitting, excessive corrosion, arc strikes, gouges, surface discontinuities, dents, and other signs of surface irregularities including discernible liner plate bulges. For painted or coated surfaces this includes evidence of flaking, blistering, peeling, discoloration, and other signs of potential distress of the underlying metal shell or liner system, including discernible liner plate bulges. 3. Specify a one-time volumetric examination of metal liner surfaces that are inaccessible from one side if triggered by plant-specific OE. The trigger for this supplemental examination is a plant-specific occurrence or recurrence of measurable metal liner corrosion (base metal material loss exceeding 10% of nominal plate thickness) initiated on the inaccessible side or areas, identified since the date of issuance of the first renewed license. This supplemental volumetric examination consists of a sample of one-foot square locations that include both randomly-selected and focused areas most likely to experience degradation based on OE and/or other relevant considerations such as environment. The supplemental volumetric examinations for each unit will occur within two refueling outages after identifying the trigger for the examination. Any identified degradation is addressed in accordance with the	B2.1.28	Program enhancements for SLR will be implemented no later than 6 months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		applicable provisions of the ASME Section XI, Subsection IWE program. The sample size, locations, and any needed scope expansion (based on findings) for this one-time set of volumetric examinations should be determined on a plant-specific basis to demonstrate statistically with 95% confidence that 95% of the accessible portion of the containment liner is not experiencing corrosion degradation with greater than 10% loss of nominal thickness.		
29	*ASME Section XI, Subsection IWL* program	The *ASME Section XI, Subsection IWL* AMP is an existing program that will be enhanced to: 1. Incorporate monitoring for changes in material properties of increase in porosity and permeability, and loss of strength and pattern cracking with darkened edges. 2. Specify that inspection results are documented and compared to previous results to identify changes from prior inspections.	B2.1.29	Program enhancements for SLR will be implemented no later than 6 months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
30	*ASME Section XI, Subsection IWF* program	The *ASME Section XI, Subsection IWF* AMP is an existing program that will be enhanced to: 1. Perform periodic evaluations of the acceptability of inaccessible areas of supports (e.g., portions of supports encased in concrete, buried underground, or encapsulated by guard pipe), when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas of supports. Perform these evaluations once every ten years during the SPEO. 2. Procedures will be revised to specify that for structural bolting consisting of ASTM A325, ASTMF1852, and/or ASTM A490, the preventative actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for Structural Connections) publication, "*Specification for Structural Joints Using ASTM A325 or A490 Bolts*," will be used. 3. Procedures will be revised to specify that whenever replacement of bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants will be in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339. 4. Perform a one-time inspection within five years prior to entering the SPEO of an additional 5% of the sample populations for Class 1, 2, and 3 piping supports. The additional supports will be selected from the remaining population of IWF piping supports and will include components that are most susceptible to age-related degradation.	B2.1.30	Program enhancements for SLR will be implemented and a one-time inspection of an additional 5% of the sample size specified in Table IWF-2500-1 for Class 1, 2, and 3 piping supports is conducted within 5 years prior to the SPEO, and is to be completed prior to the SPEO. Other enhancements are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		5. Procedures will be revised to specify that, for NSSS component supports, high strength bolting greater than one inch nominal diameter, volumetric examination comparable to that of ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1 will be performed to detect cracking in addition to VT-3 examination. In each 10 year period during the SPEO, a representative sample of bolts will be inspected. The sample of high strength bolting greater than one inch nominal diameter subject to volumetric examination will consist of 17 bolts per unit. The sample shall include the bolting that is most susceptible to age-related degradation (i.e., based on time in service, aggressive environment, etc). 6. If a component does not exceed the acceptance standards of IWF-3400 but is repaired to as-new condition, the sample is increased or modified to include another support that is representative of the remaining population of supports that were not repaired.		
31	*10 CFR Part 50, Appendix J* program	The existing *10 CFR Part 50, Appendix J* program is credited.	B2.1.31	Ongoing
32	*Masonry Walls* program	The *Masonry Walls* AMP is an existing program that will be enhanced to update the parameters monitored to identify potential shrinkage and/or separation of masonry walls and include loss of material in addition to the currently managed cracking at joints.	B2.1.32	Program enhancements for SLR will be implemented no later than 6 months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
33	*Structures Monitoring* program	The *Structures Monitoring* AMP is an existing program that will be enhanced to: 1. Add the following structures to the scope of the program: a. Microwave House Structure b. Technical Support Building Cable Vault c. 100 kV Structure d. Protected Service Water Building e. Protected Service Water Duct Banks f. Borated Water Storage Tank Superstructure g. HP Office Building h. Administration Building 2. Procedures will be revised to specify that structural components inspected include structural bolting, anchor bolts and embedments, supports and bracings associated with masonry walls, pipe whip restraints and jet impingement shields, transmission towers, panels and other enclosures, racks, sliding surfaces, sump and pool liners, electrical cable trays and conduits, tube tracks, electrical duct banks, manholes, doors, penetration seals, and other elastomeric materials.	B2.1.33	Program enhancements for SLR will be implemented no later than 6 months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		3. Expand the monitoring and evaluation of raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of SLR. a. Enter adverse results, which exceed water chemistry criteria, into the corrective action program. As part of the corrective actions, if aggressive groundwater is identified that might affect structures in scope for SLR, perform additional water testing at additional locations and perform soil testing in order to confirm the extent, severity, and potential aging mechanisms resulting from the aggressive groundwater/soil. b. Develop engineering evaluations to evaluate the water chemistry results to assess the impact, if any, on below-grade concrete, including the potential for further degradation due to the aggressive groundwater, as well as consideration of current conditions. As part of the engineering evaluations, determine if additional actions are warranted, which might include enhanced inspection techniques and/or increased frequency, destructive testing, and focused inspections of representative accessible (leading indicator) or below-grade, inaccessible concrete structural elements exposed to aggressive groundwater/soil. c. Develop the initial engineering evaluations prior to the SPEO. Develop follow-up engineering evaluations on an interval not to exceed five years.		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		d. If aggressive groundwater and soil is identified, at a minimum, perform focused inspections of representative, accessible (leading indicator) structural elements, or if accessible areas will not be leading indicators for the potential aging mechanisms, excavate and inspect buried concrete elements exposed to aggressive groundwater/soil. e. If degraded concrete is identified, as part of the focused inspections of leading indicators (representative, accessible or exposed inaccessible concrete), enter adverse results that exceed ACI 349.3R second tier criteria into the corrective action program, and expose inaccessible concrete so that the extent of the condition can be determined, baseline conditions documented, and additional actions identified such as repairs, new preventive actions, additional evaluations, and future inspections. 4. For structural bolting consisting of ASTM A325, ASTMF1852, and/or ASTM A490, provide guidance for storage, lubricants, and the steps to minimize stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for Structural Connections) publication, "*Specification for Structural Joints Using ASTM A325 or A490 Bolts*". 5. Provide guidance so that when replacement bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants will be in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339.		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		6. Provide guidance for proper specification of new high strength bolting material and lubricant to prevent or mitigate degradation and failure of structural bolting in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339. 7. Expand the program to include details regarding inspection and evaluation for steel liners. 8. Provide inspection and evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. The program will be enhanced to explicitly mention the changes in material properties of increase in porosity and permeability, and loss of strength and pattern cracking with darkened edges. 9. Develop a new implementing procedure or revise an existing implementing procedure to address aging management of inaccessible areas exposed to potentially aggressive groundwater/soil environment that will include the following: a. Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of SLR. b. Enter adverse results, which exceed water chemistry criteria, into the corrective action program. As part of the corrective actions, if aggressive groundwater is identified that might affect structures in scope for SLR, perform additional water testing at additional locations and perform soil testing in order to confirm the extent, severity, and potential aging mechanisms resulting from the aggressive groundwater/soil.		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		c. Develop engineering evaluations to evaluate the water chemistry results to assess the impact, if any, on below-grade concrete, including the potential for further degradation due to the aggressive groundwater, as well as consideration of current conditions. As part of the engineering evaluations, determine if additional actions are warranted, which might include enhanced inspection techniques and/or increased frequency, destructive testing, and focused inspections of representative accessible (leading indicator) or below grade, inaccessible concrete structural elements exposed to aggressive groundwater/soil. d. Develop the initial engineering evaluations prior to the SPEO. Develop follow-up engineering evaluations on an interval not to exceed five years. e. If aggressive groundwater and soil is identified, at a minimum, perform focused inspections of representative, accessible (leading indicator) structural elements, or if accessible areas will not be leading indicators for the potential aging mechanisms, excavate and inspect buried concrete elements exposed to aggressive groundwater/soil. f. If degraded concrete is identified, as part of the focused inspections of leading indicators (representative, accessible or exposed inaccessible concrete), enter adverse results that exceed ACI 349.3R second tier criteria into the corrective action program, and expose inaccessible concrete so that the extent of the condition can be determined, baseline conditions documented, and additional actions identified such as repairs, new preventative actions, additional evaluations, and future inspections.		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		10. Monitor and trend through-wall groundwater leakage, infiltration volumes, and leakage water chemistry for signs of concrete or steel reinforcement degradation. Develop additional engineering evaluations, which consider more frequent inspections, as well as destructive testing of affected concrete to validate existing concrete properties, and leakage water chemistry results. If leakage volumes allow, consider water chemistry analysis of the leakage pH, along with mineral, chloride, sulfate and iron content in the water. 11. Expand the program to monitor accessible sliding surfaces for indications of significant loss of material due to wear or corrosion, and for accumulation of debris or dirt. Establish acceptance criteria for sliding surfaces as no significant loss of material due to wear or corrosion, and no debris or dirt that could restrict or prevent sliding of the surfaces, as required by design. 12. Expand the program to monitor elastomeric vibration isolators and bearing pads, structural sealants, and seismic joint fillers for cracking, loss of material, and hardening. Supplement visual inspection of elastomeric elements with tactile inspection to detect hardening, if the intended function is suspect. Establish acceptance criteria, for elastomeric pads and vibration isolation elements, structural sealants, and seismic joint fillers, as no loss of material, cracking, or hardening that can lead to loss of isolation or support function. 13. Require that personnel performing inspections and evaluations meet the qualifications specified within ACI 349.3R with respect to knowledge of inservice inspection of concrete and visual acuity requirements. 14. Perform inspections under the enhanced program in order to establish quantitative baseline inspection data to a sufficient detail to allow for trending, prior to the SPEO.		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		15. Revise inspection procedures to base inspection acceptance criteria on quantitative requirements derived from industry codes and standards, including but not limited to ACI 349.3R, ACI 318, SEI/ASCE 11, or the relevant AISC specifications and consider industry and plant OE. Use justified quantitative acceptance criteria whenever applicable. 16. Provide evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. Base the acceptance criteria for concrete surfaces on the “second-tier” evaluation criteria provided in Chapter 5 of ACI 349.3R. 17. Clarify that loose bolts and nuts are not acceptable unless accepted by engineering evaluation.		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
34	*Inspection of Water Control Structures Associated With Nuclear Power Plants* program	The *Inspection of Water Control Structures Associated With Nuclear Power Plants* AMP is an existing program that will be enhanced to: 1. Provide guidance for structural bolting consisting of ASTM A325, ASTMF1852, and/or ASTM A490, for storage, lubricants, and the steps to minimize stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for Structural Connections) publication, *"Specification for Structural Joints Using ASTM A325 or A490 Bolts"*. 2. Provide guidance so that when replacement bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants will be in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339. 3. Provide guidance for proper specification of new high strength bolting material and lubricant to prevent or mitigate degradation and failure of structural bolting in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339.	B2.1.34	Program enhancements for SLR will be implemented no later than 6 months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		4. Provide inspection and evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. The program will be enhanced to incorporate monitoring for movements (e.g., settlement, heaving, and deflection), conditions at junctions with abutments and embankments, pattern cracking with darkened edges, the changes in material properties of increase in porosity and permeability, and loss of strength. 5. Expand the program to monitor accessible sliding surfaces for indications of significant loss of material due to wear or corrosion, and for accumulation of debris or dirt. Establish acceptance criteria for sliding surfaces as no significant loss of material due to wear or corrosion, and no debris or dirt that could restrict or prevent sliding of the surfaces, as required by design. 6. Require that personnel performing inspections and evaluations meet the qualifications specified within ACI 349.3R with respect to knowledge of inservice inspection of concrete and visual acuity requirements. 7. Create provisions for special inspections immediately following the occurrence of significant natural phenomena, such as large floods, earthquakes, hurricanes, tornadoes, or intense local rainfalls. 8. Require the evaluation of raw water and groundwater chemistry that is sampled from a location that is representative of the water in contact with structures within the scope of SLR by the responsible engineer. This will be done on an interval not to exceed five years and account for seasonal variations (e.g., quarterly monitoring every fifth year).		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		9. Develop a new implementing procedure or revise an existing implementing procedure to enhance the aging management of inaccessible areas exposed to potentially aggressive groundwater/soil environment that will include the following: a. Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of SLR. b. Enter adverse results, which exceed water chemistry criteria, into the corrective action program. As part of the corrective actions, if aggressive groundwater is identified that might affect structures in scope for SLR, perform additional water testing at additional locations and perform soil testing in order to confirm the extent, severity, and potential aging mechanisms resulting from the aggressive groundwater/soil. c. Develop engineering evaluations to evaluate the water chemistry results to assess the impact, if any, on below-grade concrete, including the potential for further degradation due to the aggressive groundwater, as well as consideration of current conditions. As part of the engineering evaluations, determine if additional actions are warranted, which might include enhanced inspection techniques and/or increased frequency, destructive testing, and focused inspections of representative accessible (leading indicator) or below grade, inaccessible concrete structural elements exposed to aggressive groundwater/soil.		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		d. Develop the initial engineering evaluations prior to the SPEO. Develop follow-up engineering evaluations on an interval not to exceed five years. e. If aggressive groundwater and soil is identified, at a minimum, perform focused inspections of representative, accessible (leading indicator) structural elements, or if accessible areas will not be leading indicators for the potential aging mechanisms, excavate and inspect buried concrete elements exposed to aggressive groundwater/soil. f. If degraded concrete is identified, as part of the focused inspections of leading indicators (representative, accessible or exposed inaccessible concrete), enter adverse results that exceed ACI 349.3R second tier criteria into the corrective action program, and expose inaccessible concrete so that the extent of the condition can be determined, baseline conditions documented, and additional actions identified such as repairs, new preventative actions, additional evaluations, and future inspections. 10. Monitor and trend through-wall groundwater leakage, infiltration volumes, and leakage water chemistry for signs of concrete or steel reinforcement degradation. Develop additional engineering evaluations, which consider more frequent inspections, as well as destructive testing of affected concrete to validate existing concrete properties, and leakage water chemistry results. If leakage volumes allow, consider water chemistry analysis of the leakage pH, along with mineral, chloride, sulfate and iron content in the water. 11. Perform inspections under the enhanced program in order to establish quantitative baseline inspection data to a sufficient detail to allow for trending, prior to the SPEO.		

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
		12. Provide evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. Base the acceptance criteria for concrete surfaces on the “second-tier” evaluation criteria provided in Chapter 5 of ACI 349.3R. 13. Clarify that loose bolts and nuts are not acceptable unless accepted by engineering evaluation. 14. Degradation of piles and sheeting are accepted by engineering evaluation or subject to corrective actions. 15. Revise inspection procedures to base inspection acceptance criteria on quantitative requirements derived from industry codes and standards, including but not limited to ACI 349.3R, ACI 318, SEI/ASCE 11, or the relevant AISC specifications and consider industry and plant OE. Use justified quantitative acceptance criteria whenever applicable.		
35	*Protective Coating Monitoring and Maintenance* program	The *Protective Coating Monitoring and Maintenance* AMP is an existing program that will be enhanced to: 1. Revise procedures to explicitly state peeling and physical damage are considered in the condition assessment. 2. Revise procedures to reference ASTM D-5163-08.	B2.1.35	Program enhancements for SLR will be implemented no later than 6 months prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
36	*Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	The *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is an existing program that will be enhanced to: 1. As part of the periodic inspections, add review of previously identified and mitigated adverse localized environments' cumulative aging effects applicable to in-scope cable and connection insulation to confirm that the insulation's intended functions continue to be supported during the SPEO. 2. Add a description of potential testing and its sampling: If testing is evaluated to be necessary after visual inspections identify degraded or damaged conditions (e.g. unacceptable surface anomalies) that may adversely affect the performance of cable or connection insulation intended functions, then proven test(s) applicable to condition monitoring of the insulation are performed (e.g., thermography may be included). For a large number of cables identified as degraded, a sample population will be tested. The sample size will be 20 percent of each affected cable and connection type with a maximum sample size of 25. Among the factors to consider for developing the test sample population are cable or connection type, environment, voltage level, circuit loading, and insulation material which is the most important factor per EPRI guidance. Testing as part of an existing maintenance, calibration, or surveillance program may be credited. The basis for the sample selection will be documented. 3. Add acceptance criteria for potential testing of accessible cables and connections with unacceptable visual inspection results to the Oconee AMP description: Test results are to be within the acceptance criteria, as identified in the Oconee procedures.	B2.1.36	Program enhancements for SLR will be implemented no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
37	*Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification (EQ) Requirements Used in Instrumentation Circuits* program	The *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification (EQ) Requirements Used in Instrumentation Circuits* AMP is a new program that will manage the effects of reduced insulation resistance of non-EQ cable and connection insulation in instrumentation circuits with sensitive, high voltage, low level current signals and that are subjected to adverse localized environments caused by temperature, radiation, or moisture. The program evaluates electrical insulation material for cables and connections subjected to an adverse localized environment at least once every 10 years. The AMP will apply to the in-scope non-EQ portions of circuits in the area radiation monitoring system (e.g. high range containment area radiation monitors) and the neutron flux monitoring nuclear instrumentation system. Industry and plant-specific OE will be considered in the development and implementation of the program.	B2.1.37	Program for SLR will be implemented 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
38	*Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	The *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is an existing program that will be enhanced to: 1. Add inspections for water accumulation performed after event-driven occurrences, such as heavy rain, rapid thawing of heavy ice and snow, or flooding. 2. For the periodic water accumulation inspections, add documented verification that either automatic or passive drainage systems or manual pumping are effective in preventing medium-voltage cable exposure to significant moisture. 3. Remove from program descriptions the original 'significant voltage' portion of exposures to determine the inaccessible medium-voltage cables for testing. 4. Revise the inaccessible medium-voltage cable testing and water accumulation inspection matrix to include inspection methods, test methods, and acceptance criteria.	B2.1.38	Program enhancements for SLR will be implemented no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.
39	*Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	The *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is a new condition monitoring program that will manage the aging effect of reduced electrical insulation resistance due to exposure to significant moisture. The program will apply to the electrical insulation for inaccessible (e.g., installed underground in buried conduits, cable trenches, cable troughs, duct banks, vaults, manholes, or direct buried), non-EQ in-scope instrument and control cables and splices that are exposed to significant moisture. Industry and plant-specific OE will be considered in the development of this program.	B2.1.39	Program will be implemented 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
40	*Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	The *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is a new condition monitoring program that will manage the aging effects of reduced electrical insulation resistance due to exposure to significant moisture. The program will apply to the electrical insulation for inaccessible (e.g., installed underground in buried conduits, cable trenches, cable troughs, duct banks, vaults, manholes, or direct buried), non-EQ in-scope low voltage power cables (operating voltage less than 2 kV), exposed to significant moisture. Industry and plant-specific OE will be evaluated in the development of this program.	B2.1.40	Program will be implemented 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.
41	*Metal Enclosed Bus* program	The *Metal Enclosed Bus* AMP is a new condition monitoring program that uses inspections and sampling and will manage the identified aging effects of in-scope metal enclosed bus. Industry and plant-specific OE will be considered in the development and implementation of this program.	B2.1.41	The program will be implemented no later than 6 months prior to the SPEO. Initial inspections and resistance measurements will be performed no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.
42	*Fuse Holders* program	The *Fuse Holders* AMP is a new condition monitoring program that will manage susceptibility to the following aging effects: increased resistance of connection due to chemical contamination, corrosion, and oxidation or fatigue caused by ohmic heating, thermal cycling, electrical transients, frequent removal and replacement, or vibration. The program also manages degradation of electrical insulation for the fuse holders with metallic clamps susceptible to the aging effects identified. Industry and plant-specific OE will be considered in the development and implementation of this program.	B2.1.42	The program for SLR will be implemented no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
43	*Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	The *Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program is a new condition monitoring program that will manage aging effects by testing a representative sample of electrical connectors prior to the SPEO. The results will be evaluated to determine if there is a need for subsequent periodic testing on a 10-year frequency. Industry and plant-specific OE will be considered in the development and implementation of this program.	B2.1.43	The program for SLR will be implemented and testing of a representative sample of electrical connectors completed, no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.
44	*Fatigue Monitoring* program	The *Fatigue Monitoring* AMP is an existing program that will be enhanced to: 1. Require monitoring and tracking of transient cycles associated with the ASME Code, Section XI, Appendix L analysis be performed between the inspections for each ASME Code, Section XI, Appendix L locations. Consistent with existing program cycle counting, a surveillance limit will be established to initiate corrective action prior to exceeding transient cycle assumptions in the ASME Code, Section XI, Appendix L analysis. 2. Require periodic validation of chemistry parameters used to determine F_{en} factors used. 3. Expand existing corrective action guidance associated with exceeding a cycle counting surveillance limit to recommend consideration of component repair, component replacement, performance of a more rigorous analysis, performance of an ASME Code, Section XI, Appendix L flaw tolerance analysis, or scope expansion to consider other locations with the highest expected CUF_{en} values.	B3.1	Program enhancements for SLR will be implemented no later than six months prior to the SPEO.
45	*Neutron Fluence Monitoring* program	The existing *Neutron Fluence Monitoring* program is credited.	B3.2	Ongoing

Table A6.0-1: Subsequent License Renewal Commitments

#	Program	Commitment	AMP	Implementation
46	*Environmental Qualification of Electric Equipment* program	The *Environmental Qualification of Electric Equipment* AMP is an existing program that will be enhanced to: 1. Add activities to perform visual inspections of accessible, passive EQ electric equipment located in adverse localized environments at least once every 10 years. 2. Establish acceptance criteria for the visual inspection of accessible passive EQ electric equipment located in adverse localized environments.	B3.3	Program enhancements for SLR will be implemented no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.
47	*Concrete Containment Unbonded Tendon Prestress* program	The existing *Concrete Containment Unbonded Tendon Prestress* program is credited.	B3.4	Ongoing
48	*Secondary Shield Wall Tendon Surveillance* program	The *Secondary Shield Wall Tendon Surveillance* AMP is an existing program that will be enhanced to revise station procedures to include a review of previous visual inspection and lift-off data results for the tendons selected for inspection.	B4.1	Program enhancements for SLR will be implemented no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.

B AGING MANAGEMENT PROGRAM

List of Tables

Oconee Nuclear Station

Units 1, 2, and 3

Application for Subsequent License Renewal

Appendix B

AGING MANAGEMENT PROGRAM

B1.0 INTRODUCTION

B1.1 OVERVIEW

SLR AMP descriptions are provided in this appendix for each program that has been credited for managing the effects of aging based upon the aging management review results provided in Sections 3.1 through 3.6.

In general, there are four types of AMPs:

1. Prevention programs preclude aging effects from occurring.

2. Mitigation programs slow the effects of aging.

3. Condition monitoring programs inspect/examine for the presence and extent of aging.

4. Performance monitoring programs test the ability of a structure or component to perform its intended function.

More than one type of AMP may be implemented for a component to ensure that aging effects are managed.

Part of the demonstration that the effects of aging are adequately managed is to evaluate credited programs and activities against certain required attributes. Each of the AMPs described in this section has 10 elements which are consistent with the attributes described in Appendix A.1, *"Aging Management Review - Generic (Branch Technical Position RLSB-1)"* and in Table A.1-1 *"Elements of an Aging Management Program for Subsequent License Renewal"* of NUREG-2192. The 10-element detail is not provided when the program is deemed to be consistent with the assumptions made in NUREG-2191. The 10-element detail is only provided when the program is plant-specific.

Existing initial LR aging management activities were used as a starting point for SLR AMPs. For initial LR, ONS addressed license renewal before the publication of the GALL. In fact, much of the foundation of GALL comes from the structure of the Initial LR work and lessons learned from review of these materials. Similar to efforts described in GALL-SLR, programmatic aging management activities were identified for those components whose materials and environment combinations could lead to aging effects that, if left unmanaged, could result in loss of component intended function. Results of that work are not significantly different that the results herein. Initial Oconee LR resulted in the crediting of 45 existing aging management programs and activities and 5 new programs and activities. The majority of these programs and activities will carry forward into the SPEO, noting that GALL-SLR recombines some of these existing programs and activities under new program titles. Where new and existing programs are credited for SLR, the programs are in alignment with contemporary guidance.

For SLR, whenever an initial LR aging management activity did not exist, credit has been taken for other existing plant programs. As such, existing programs and activities associated with a system, structure, component, or commodity grouping were reviewed to determine whether they include the necessary actions to adequately manage the effects of aging during the SPEO.

Existing plant programs were often based on a regulatory commitment or requirement, rather than aging management. Many of these existing programs required for initial LR included the 10-element attributes, and have been demonstrated to adequately manage the identified aging effects. If an existing program is not believed to adequately manage an identified aging effect during the SPEO, then the program will be enhanced as necessary as discussed further below. Occasionally, the creation of a new program has been deemed necessary for purposes of SLR.

Included in Appendix A6.0, Table A6.0-1, SLR Commitments, are commitments for SLR with the associated implementation schedule for when Duke Energy plans to complete each commitment.

B1.2 METHOD OF DISCUSSION

Each of the AMPs in Sections B2.1.1 through B3.4 are consistent with the assumptions in Sections X and XI of NUREG-2191, or are consistent with exceptions and/or enhancements, and contain the following:

1. Program Description summary of the overall program form and function.
2. NUREG-2191 Consistency statement about the program.
3. Discussion of any exceptions to the NUREG-2191 program with a justification.
4. Discussion of any enhancements or additions to ensure consistency with NUREG-2191 along with a proposed schedule for completion.
5. OE information specific to the program. This includes both plant-specific and industry OE.
6. Conclusion with a bases statement of reasonable assurance that the existing program is effective, or will be effective when implemented, if new or enhanced.

The plant-specific AMPs are described in terms of the 10 program elements in NUREG-2192, Section A.1.2.3 *"Aging Management Program Elements"*.

B1.3 QUALITY ASSURANCE PROGRAM AND ADMINISTRATIVE CONTROLS

The QA Program is described in the Duke Energy Corporation Topical Report DUKE-QAPD-001-A, *"Quality Assurance Program Description, Operating Fleet"* which implements the requirements of 10 CFR 50, Appendix B, *"Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."* The QA Program is consistent with the summary in Appendix A.2, *"Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1)"* of NUREG-2192. The QA Program includes the three elements of corrective actions, confirmation process, and administrative controls, which are applicable to the safety related and non-safety related structures, components and commodity groups that are subject to aging management review. Generically the three elements are applicable as follows:

Corrective Actions:

Results that do not meet acceptance criteria are addressed as conditions adverse to quality or significant conditions adverse to quality under Sections 17.3.1.6, 17.3.2.13, and D17.3.2.13 *"Corrective Action,"* of DUKE-QAPD-001-A. The corrective action program is implemented in accordance with the requirements of 10 CFR 50, Appendix B, Criterion XVI and Topical Report DUKE-QAPD-001-A. A single program is used regardless of the safety classification of the structure or component. Conditions adverse to quality, such as failures, malfunctions, deviations, defective material and equipment, and non-conformances, are promptly identified and corrected. Corrective actions are implemented through the initiation of a nuclear condition report for actual or potential problems, correction of an equipment deficiency, or the need for corrective maintenance. Site documents that implement AMPs for LR direct that a nuclear condition report be prepared in accordance with those procedures whenever non-conforming conditions are found (i.e., the acceptance criteria are not met). The corrective action procedures specify steps for promptly reporting, evaluating, and correcting conditions adverse to quality and significant conditions adverse to quality commensurate with the significance of the SSC or activity. Consistent with the significance of the identified condition, these steps include: (1) deficiency identification, (2) deficiency review, impact on operations and reportability determination, (3) nuclear condition report review, trending and classification (including appropriate cause determination along with any warranted extent of condition and extent of cause), (4) corrective action determinations, assignments, and implementation, (5) assessment of effectiveness of correction, and (6) nuclear condition report closure.

In the case of significant conditions adverse to quality, measures are implemented to ensure that: (a) senior station management is notified; (b) cause is determined; (c) corrective action is taken to preclude repetition; (d) the cause and corrective actions are documented and reported to station management; and (e) corrective action is taken in a timely and accurate manner.

Confirmation Process:

The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions and preclude repetition of adverse conditions. The Duke Energy corrective action program includes measures for timely evaluation of adverse conditions and implementation of corrective actions.

The program stresses that verification of implementation and close-out of corrective action documentation take place and contains measures to monitor these activities by site and oversight personnel. Plant procedures include provisions for timely evaluation of adverse conditions and implementation of corrective actions required, including root cause evaluations and prevention of repetition where appropriate (e.g.; significant conditions adverse to quality). These procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating and approving corrective actions, and ensure that corrective actions have been effectively implemented. The corrective action process is also monitored for potentially adverse trends. Identification of a potentially adverse trend due to recurring or repetitive unacceptable conditions will result in the initiation of a nuclear condition report. The AMPs required for SLR would also result in identification of related unsatisfactory conditions due to ineffective corrective action. Since the same 10 CFR 50, Appendix B corrective actions and confirmation process are applied for non-conforming safety related and non-safety related structures and components subject to aging management review for SLR, the confirmation process is consistent with the NUREG-2191 elements.

Administrative Controls:

Information on the Duke Energy organizational structure, responsibilities, authorities, and personnel qualification requirements is provided in the UFSAR and in the QA Program. The organizational structure, responsibilities, authorities, and personnel qualification requirements conform to 10 CFR 50, Appendix B, Criterion I. The QA Program provides orderly and uniform administrative and managerial controls for safe operation of its nuclear stations. Administrative controls apply to applicable activities, documents, procedures, and instructions regardless of the safety classification of the associated system, structure, component, or commodity group.

Document control processes are implemented in accordance with the requirements of 10 CFR 50, Appendix B, Criterion VI. Measures are provided to assure that documents, including revisions or changes, are properly reviewed by independent personnel, approved, and distributed prior to use; this includes those for the activities performed under the programs credited for aging management. Administrative controls also provide for formal review and approval of corrective actions. The administrative controls apply to both safety related and non-safety related structures, components and commodity groups which are subject to aging management review.

B1.4 OPERATING EXPERIENCE

OE from internal (also referred to as plant-specific) and external (also referred to as industry) sources is captured and systematically reviewed on an ongoing basis in accordance with the QA Program, which meets the requirements of 10 CFR 50, Appendix B, and with the OE Program, which meets the requirements of NUREG-0737, *"Clarification of TMI Action Plan Requirements,"* Item I.C.5, *"Procedures for Feedback of OE to Plant Staff."* The OE Program interfaces with, and relies on, active participation in the INPO OE program, as endorsed by the NRC.

OE is used at ONS to enhance plant programs, prevent repeat events, and prevent events that are similar to those that have occurred at other plants. As a part of the Duke Energy fleet, ONS receives OE (internal and external) daily.

The OE process includes screening, evaluation, and acting on OE documents and information to prevent or mitigate the consequences of similar events. The OE process includes review of OE from internal and external sources. External OE includes INPO documents, NRC documents (e.g., Information Notices, Regulatory Issues Summaries, and Interim Staff Guidance), and other documents (e.g., Licensee Event Reports and 10 CFR Part 21 reports, as well as relevant research and development information). Relevant research and development sources include: (a) industry consensus standards development organizations (e.g., ASME, IEEE, ACI, API, NACE, International Organization for Standardization); (b) Electric Power Research Institute (EPRI); (c) generic communications issued by the staff based on research conducted by national labs used by the NRC; and (d) NSSS vendor and owner's groups. In addition, the license renewal interim staff guidance documents and revisions to the Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report are considered as sources of industry OE and evaluated accordingly. Internal OE includes relevant items from the corrective action program and other lessons learned from internal events as captured in program health reports and program assessments.

The Duke Energy fleet OE program that is implemented at ONS is an ongoing program that conforms to the recommendations of LR-ISG-2011-05, "Ongoing Review of Operating Experience," and is consistent with the expectations outlined in NUREG-2192 (SRP-SLR), Appendix A.4, "Operating Experience for Aging Management Programs." The systematic review of plant-specific and industry OE concerning aging management and age-related degradation ensures that the LR AMPs are, and will continue to be, effective in managing the aging effects for which they are credited. OE involving age-related degradation is tracked and trended such that adverse trends are entered into the corrective action program for evaluation. Potential aging issues associated with SSCs within the scope of LR are evaluated with regard to: (a) materials of construction, (b) operating environment, (c) aging effects, (d) aging mechanisms, and (e) AMPs, to determine if changes to AMPs or new AMPs are needed. Existing AMPs are enhanced, or new AMPs are developed, when it is determined through the evaluation of OE that the effects of aging may not be adequately managed. AMPs are informed by the review of OE on an ongoing basis, regardless of the AMPs implementation schedule. Guidelines have been established for reporting plant-specific OE regarding age-related degradation and aging management to the industry through the INPO consolidated event system, consistent with the guidance in NEI 14-13, *"Use of Industry OE for Age-Related Degradation and Aging Management Programs."* In addition, the Duke Energy process requires assessments of the effectiveness of AMPs/activities to be conducted on a periodic basis that is not to exceed once every five years. If there is an indication that the effects of aging are not being adequately managed, then a corrective action is entered into the 10 CFR Part 50, Appendix B, corrective action program to either enhance the AMPs or develop and implement new AMPs, as appropriate. The AMP effectiveness reviews are performed consistent with the guidance of NEI 14-12, *"Aging Management Program Effectiveness."*

Each AMP summary in this appendix contains examples of OE relevant to the program. This information is obtained through the review of plant-specific OE captured by the corrective action program, program assessments, and program health reports, as well as the review of industry OE. New programs utilized plant-specific and/or industry OE, as applicable, and the AMP summaries in this appendix discuss the OE and associated corrective actions as they relate to implementing the new program. Consistent with the guidance in Section 6 of Appendix B of NEI 17-01, "Industry Guideline for Implementing the Requirements of 10 CFR 54 for Subsequent License Renewal," effectiveness reviews of initial LR AMPs/activities were performed, and are presented within the SLRA Appendix B AMP subsections that are most related to those initial LR aging management activities. The OE summary for each AMP in this appendix identifies past corrective actions, some of which have resulted in program enhancements and provides objective evidence that the effects of aging have been, and will continue to be, adequately managed so that the intended functions of the structures and components within the scope of each program will be adequately maintained during the SPEO.

B1.5 NUREG-2191 AMP CORRELATION

The correlation between NUREG-2191, "*Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,"* programs and the programs that have been credited for managing the effects of aging in the SLRA are shown in Table B1-1. For the programs, links to the sections that include the program descriptions are provided.

Table B1-1 Correlation: NUREG-2191 Program with Oconee Nuclear Station Program

NUREG-2191 Number	NUREG-2191 Program	Oconee Nuclear Station Program	Appendix B Reference
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	ASME XI Inservice Inspection, Subsections IWB, IWC, and IWD	B2.1.1
XI.M2	Water Chemistry	Water Chemistry	B2.1.2
XI.M3	Reactor Head Closure Stud Bolting	Reactor Head Closure Stud Bolting	B2.1.3
XI.M4	BWR Vessel ID Attachment Welds	Not Applicable to a PWR	N/A
XI.M7	BWR Stress Corrosion Cracking	Not Applicable to a PWR	N/A
XI.M8	BWR Penetrations	Not Applicable to a PWR	N/A
XI.M9	BWR Vessel Internals	Not Applicable to a PWR	N/A
XI.M10	Boric Acid Corrosion	Boric Acid Corrosion	B2.1.4
XI.M11B	Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWR Only)	Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components	B2.1.5

Table B1-1 Correlation: NUREG-2191 Program with Oconee Nuclear Station Program

NUREG-2191 Number	NUREG-2191 Program	Oconee Nuclear Station Program	Appendix B Reference
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	B2.1.6
XI.M16A	PWR Vessel Internals	PWR Vessel Internals	B2.1.7
XI.M17	Flow Accelerated Corrosion	Flow Accelerated Corrosion	B2.1.8
XI.M18	Bolting Integrity	Bolting Integrity	B2.1.9
XI.M19	Steam Generators	Steam Generators	B2.1.10
XI.M20	Open Cycle Cooling Water System	Open Cycle Cooling Water System	B2.1.11
XI.M21A	Closed Treated Water Systems	Closed Treated Water Systems	B2.1.12
XI.M22	Boraflex Monitoring	Not Applicable	N/A
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	B2.1.13
XI.M24	Compressed Air Monitoring	Compressed Air Monitoring	B2.1.14
XI.M25	BWR Reactor Water Cleanup System	Not Applicable to a PWR	N/A
XI.M26	Fire Protection	Fire Protection	B2.1.15
XI.M27	Fire Water System	Fire Water System	B2.1.16

Table B1-1 Correlation: NUREG-2191 Program with Oconee Nuclear Station Program

NUREG-2191 Number	NUREG-2191 Program	Oconee Nuclear Station Program	Appendix B Reference
XI.M29	Outdoor and Large Atmospheric Metallic Storage Tanks	Outdoor and Large Atmospheric Metallic Storage Tanks	B2.1.17
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry	B2.1.18
XI.M31	Reactor Vessel Material Surveillance	Reactor Vessel Material Surveillance	B2.1.19
XI.M32	One-Time Inspection	One-Time Inspection	B2.1.20
XI.M33	Selective Leaching	Selective Leaching	B2.1.21
XI.M35	ASME Code Class 1 Small Bore Piping	ASME Code Class 1 Small Bore Piping	B2.1.22
XI.M36	External Surfaces Monitoring of Mechanical Components	External Surfaces Monitoring of Mechanical Components	B2.1.23
XI.M37	Flux Thimble Tube Inspection	Not Applicable	N/A
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	B2.1.24
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis	B2.1.25
XI.M40	Monitoring of Neutron Absorbing Materials Other Than Boraflex	Not Applicable	N/A

Table B1-1 Correlation: NUREG-2191 Program with Oconee Nuclear Station Program

NUREG-2191 Number	NUREG-2191 Program	Oconee Nuclear Station Program	Appendix B Reference
XI.M41	Buried and Underground Piping and Tanks	Buried and Underground Piping and Tanks	B2.1.26
XI.M42	Internal Coatings/Linings for In Scope Piping, Piping Components, Heat Exchangers, and Tanks	Internal Coatings/Linings for In Scope Piping, Piping Components, Heat Exchangers, and Tanks	B2.1.27
XI.S1	ASME Section XI, Subsection IWE	ASME Section XI, Subsection IWE	B2.1.28
XI.S2	ASME Section XI, Subsection IWL	ASME Section XI, Subsection IWL	B2.1.29
XI.S3	ASME Section XI, Subsection IWF	ASME Section XI, Subsection IWF	B2.1.30
XI.S4	10 CFR Part 50, Appendix J	10 CFR Part 50, Appendix J	B2.1.31
XI.S5	Masonry Walls	Masonry Walls	B2.1.32
XI.S6	Structures Monitoring	Structures Monitoring	B2.1.33
XI.S7	Inspection of Water Control Structures Associated with Nuclear Power Plants	Inspection of Water Control Structures Associated with Nuclear Power Plants	B2.1.34
XI.S8	Protective Coating Monitoring and Maintenance	Protective Coating Monitoring and Maintenance	B2.1.35

Table B1-1 Correlation: NUREG-2191 Program with Oconee Nuclear Station Program

NUREG-2191 Number	NUREG-2191 Program	Oconee Nuclear Station Program	Appendix B Reference
XI.E1	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B2.1.36
XI.E2	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	B2.1.37
XI.E3A	Electrical Insulation for Inaccessible Medium Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B2.1.38
XI.E3B	Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B2.1.39
XI.E3C	Electrical Insulation for Inaccessible Low Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B2.1.40
XI.E4	Metal Enclosed Bus	Metal Enclosed Bus	B2.1.41

Table B1-1 Correlation: NUREG-2191 Program with Oconee Nuclear Station Program

NUREG-2191 Number	NUREG-2191 Program	Oconee Nuclear Station Program	Appendix B Reference
XI.E5	Fuse Holders	Fuse Holders	B2.1.42
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B2.1.43
XI.E7	High-Voltage Insulators	Not Applicable	N/A
X.M1	Fatigue Monitoring	Fatigue Monitoring	B3.1
X.M2	Neutron Fluence Monitoring	Neutron Fluence Monitoring	B3.2
X.E1	Environmental Qualification of Electric Equipment	Environmental Qualification of Electric Equipment	B3.3
X.S1	Concrete Containment Unbonded Tendon Prestress	Concrete Containment Unbonded Tendon Prestress	B3.4
N/A	Oconee Plant-Specific Program	Secondary Shield Wall Tendon Surveillance	B4.1

B2.0 AGING MANAGEMENT PROGRAMS

Table B2-1 lists the AMPs described in this appendix and identifies the programs' consistency with NUREG-2191. As discussed in Section B1.4, both plant specific and industry OE have been reviewed and considered as it relates to both new and existing AMPs.

Table B2-1 ONS Program Consistency with NUREG-2191 Program

NUREG-2191 Program	Appendix B Reference	Existing or New	Program has NUREG-2191 Enhancements	Program has Exceptions to NUREG-2191
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	B2.1.1	Existing	X	
Water Chemistry	B2.1.2	Existing		
Reactor Head Closure Stud Bolting	B2.1.3	Existing	X	X
Boric Acid Corrosion	B2.1.4	Existing		
Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components	B2.1.5	Existing		

Table B2-1 ONS Program Consistency with NUREG-2191 Program

NUREG-2191 Program	Appendix B Reference	Existing or New	Program has NUREG-2191 Enhancements	Program has Exceptions to NUREG-2191
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	B2.1.6	New		
PWR Vessel Internals	B2.1.7	Existing	X	
Flow Accelerated Corrosion	B2.1.8	Existing	X	
Bolting Integrity	B2.1.9	Existing	X	
Steam Generators	B2.1.10	Existing		
Open Cycle Cooling Water System	B2.1.11	Existing	X	X
Closed Treated Water Systems	B2.1.12	Existing	X	
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	B2.1.13	Existing	X	
Compressed Air Monitoring	B2.1.14	Existing	X	
Fire Protection	B2.1.15	Existing	X	

Table B2-1 ONS Program Consistency with NUREG-2191 Program

NUREG-2191 Program	Appendix B Reference	Existing or New	Program has NUREG-2191 Enhancements	Program has Exceptions to NUREG-2191
Fire Water System	B2.1.16	Existing	X	X
Outdoor and Large Atmospheric Metallic Storage Tanks	B2.1.17	New		
Fuel Oil Chemistry	B2.1.18	Existing	X	
Reactor Vessel Material Surveillance	B2.1.19	Existing		X
One-Time Inspection	B2.1.20	New		
Selective Leaching	B2.1.21	New		
ASME Code Class 1 Small Bore Piping	B2.1.22	New		
External Surfaces Monitoring of Mechanical Components	B2.1.23	New		

Table B2-1 ONS Program Consistency with NUREG-2191 Program

NUREG-2191 Program	Appendix B Reference	Existing or New	Program has NUREG-2191 Enhancements	Program has Exceptions to NUREG-2191
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	B2.1.24	New		
Lubricating Oil Analysis	B2.1.25	Existing	X	
Buried and Underground Piping and Tanks	B2.1.26	Existing	X	X
Internal Coatings/Linings for In Scope Piping, Piping Components, Heat Exchangers, and Tanks	B2.1.27	New		X
ASME Section XI, Subsection IWE	B2.1.28	Existing	X	
ASME Section XI, Subsection IWL	B2.1.29	Existing	X	
ASME Section XI, Subsection IWF	B2.1.30	Existing	X	

Table B2-1 ONS Program Consistency with NUREG-2191 Program

NUREG-2191 Program	Appendix B Reference	Existing or New	Program has NUREG-2191 Enhancements	Program has Exceptions to NUREG-2191
10 CFR Part 50, Appendix J	B2.1.31	Existing		
Masonry Walls	B2.1.32	Existing	X	
Structures Monitoring	B2.1.33	Existing	X	
Inspection of Water Control Structures Associated with Nuclear Power Plants	B2.1.34	Existing	X	
Protective Coating Monitoring and Maintenance	B2.1.35	Existing	X	
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B2.1.36	Existing	X	

Table B2-1 ONS Program Consistency with NUREG-2191 Program

NUREG-2191 Program	Appendix B Reference	Existing or New	Program has NUREG-2191 Enhancements	Program has Exceptions to NUREG-2191
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	B2.1.37	New		
Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B2.1.38	Existing	X	
Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B2.1.39	New		

Table B2-1 ONS Program Consistency with NUREG-2191 Program

NUREG-2191 Program	Appendix B Reference	Existing or New	Program has NUREG-2191 Enhancements	Program has Exceptions to NUREG-2191
Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B2.1.40	New		X
Metal Enclosed Bus	B2.1.41	New		
Fuse Holders	B2.1.42	New		
Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B2.1.43	New		
Fatigue Monitoring	B3.1	Existing	X	
Neutron Fluence Monitoring	B3.2	Existing		
Environmental Qualification of Electric Equipment	B3.3	Existing	X	

Table B2-1 ONS Program Consistency with NUREG-2191 Program

NUREG-2191 Program	Appendix B Reference	Existing or New	Program has NUREG-2191 Enhancements	Program has Exceptions to NUREG-2191
Concrete Containment Unbonded Tendon Prestress	B3.4	Existing		X
Secondary Shield Wall Tendon Surveillance	B4.1	Existing	X	

B2.1 AGING MANAGEMENT PROGRAM DETAILS

B2.1.1 ASME SECTION XI INSERVICE INSPECTION, SUBSECTIONS IWB, IWC, AND IWD

Program Description

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP is an existing condition monitoring program that manages the aging effects of cracking, loss of fracture toughness, and loss of material. The program consists of periodic volumetric, surface, and/or visual examination, and leakage tests of ASME Code, Section XI Class 1, 2, and 3 pressure retaining components, including welds, pump casings, valve bodies, integral attachments, and pressure retaining bolting for assessment, identification of signs of degradation, and establishment of corrective actions.

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP implements the required component examination schedule in accordance with ASME Code Section XI, Subsection IWB-2400, IWC-2400 or IWD-2400 and examination categories, applicable components, examination methods, acceptance standards, and frequency of examination as specified in ASME Code, Section XI Tables IWB-2500-1, IWC-2500-1, and IWD-2500-1 for Class 1, 2, and 3 components, respectively. The examination methods specified in ASME Code, Section XI, Tables IWB-2500-1, IWC-2500-1, and IWD-2500-1 are based on approved industry standards for detecting degradation of components.

Indications and relevant conditions detected during examinations are documented in the corrective action program and evaluated in accordance with ASME Code, Section XI, Articles IWB-3000 for Class 1, IWC-3000 for Class 2, and IWD-3000 for Class 3. The program directs that repair and replacement activities be performed in accordance with ASME Code, Section XI, Subsection IWA-4000. Additional examinations not required by the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program, but using ASME Code, Section XI inspection techniques and acceptance criteria, are performed in accordance with the augmented inspection program.

10 CFR 50.55a, *Codes and Standards*, specifies the regulatory requirements related to inservice inspection, repair/replacement, and augmented examination of systems and components in nuclear power plants. During the fifth inservice inspection interval, ONS inservice inspections are performed consistent with the requirements of ASME Code, Section XI, 2007 Edition with the 2008 Addenda, as approved in 10 CFR 50.55a. In accordance with 10 CFR 50.55a(g)(4)(ii), the inservice inspection program is updated during each successive 120 month inspection interval to comply with the requirements of the edition of the Code that is applicable twelve months before the start of the inspection interval. ASME Code editions and addenda will be used consistent with the provisions of 10 CFR 50.55a during the SPEO. Any deviation from ASME Code, Section XI requirements must be approved by the NRC per relief request or alternate request (such as, RIS 2004-12 process).

A risk informed inservice inspection program has been implemented using ASME Code, Section XI, Code Case N-716-1 "*Alternative Classification and Examination Requirements, Section XI, Division 1*". This methodology includes Class 1 piping welds and Class 2 components (excluding attachment welds and supports). The risk informed inservice inspection program has been incorporated into the inservice inspection schedule.

The effects of aging due to fatigue for the pressurizer surge line and high pressure injection system piping subject to environmentally assisted fatigue will be managed through the *ASME Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD* program by conducting inspections in accordance with ASME Code, Section XI, Non-mandatory Appendix L.

NUREG-2192 permits inspections as a management method for fatigue as long as a flaw tolerance evaluation is performed to determine the acceptable time between inspections. As described in SLRA Section 4.3.4, *Environmentally-Assisted Fatigue*, and the *Fatigue Monitoring* AMP (B3.1), a flaw tolerance evaluation was performed for components associated with sentinel locations assessed under ASME Code, Section XI, Nonmandatory Appendix L. The flaw tolerance evaluation was used to establish an appropriate inspection frequency that is consistent with the typical 10-year inservice inspection program. As a result of the evaluation, the effects of fatigue for two of the sentinel piping locations (pressurizer surge line and high pressure Injection piping) will be managed by the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program during the SPEO.

Inspections will be performed for components associated with the following sentinel locations assessed in accordance with ASME Code, Section XI, Non-mandatory Appendix L:

- Reactor coolant system pressurizer surge line piping (hot leg elbow).
- High pressure injection piping, stop valve-to-check valve (usage bounds high pressure injection nozzle).

The ASME Code, Section XI, Appendix L inspections identified in SLRA Section 4.3 (Table 4.3.4-3) will be conducted by the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program to ensure structural integrity of the subject piping. Each weld in the inspection population will be volumetrically inspected using ASME Code required techniques at least once prior to establishing the inspection interval schedule for Units 1, 2, and 3 ASME Code, Section XI, Appendix L locations.

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP includes all component inspection activities required by ASME Code, Section XI, Subsections IWB, IWC, and IWD except for those component inspection activities that are covered by the following LR AMPs that include augmented requirements:

- *Reactor Head Closure Stud Bolting* (B2.1.3)
- *Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components* (B2.1.5)
- *PWR Vessel Internals* (B2.1.7)
- *Bolting Integrity* (B2.1.9)
- *Steam Generators* (B2.1.10)
- *ASME Code Class 1 Small-Bore Piping* (B2.1.22)
- *ASME Section XI, Subsection IWF* (B2.1.30)

Additional examinations, not required by the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP but using ASME Code, Section XI inspection techniques and acceptance criteria, are identified in the ONS augmented inspection program and are included in the inservice inspection schedule for the following:

- Generic Letter 85-20 Exams - high pressure injection nozzle safe end examination.
- Thermal fatigue exams for pressurizer surge line
- Thermal fatigue IEB 88-08 exams - thermal stress piping examinations
- Thermal fatigue exams per MRP-192
- Thermal fatigue exams per MRP-146
- Supplemental high pressure injection ultrasonic exams - safe end to pipe butt weld for Units 1, 2 or 3 B2 high pressure injection line
- HELB main feedwater pipe welds and integral welded attachment exams - main feedwater piping in the east and west penetration room
- HELB exams for main feedwater and main steam supports - main feedwater and main steam piping supports and attachment welds
- HELB exams for main steam pipe welds and integral welded attachment exams - main steam piping welds and attachment welds in the east penetration room
- HELB exams for main feedwater rupture restraint - main feedwater attachment welds on rupture restraints at penetrations 25 and 27

Three other aspects of the augmented inspections are included in non-inservice inspection programs. Inspections of the PWR reactor vessel head are described in the *Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components* program. Inspections of the PWR vessel internals are described in the *PWR Vessel Internals* program. Inspections of the high pressure injection system piping elbow to detect wall thinning due to cavitation are described in the *Flow Accelerated Corrosion* program.

<u>NUREG-2191 Consistency</u>

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program is an existing program that will be consistent with NUREG-2191 Chapter XI.M1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD.

<u>Exception to NUREG-2191</u>

None

<u>Enhancements</u>

Prior to the SPEO, the following enhancement(s) will be implemented in the following program element: Detection of Aging Effects (Element 4).

1. Procedures will be revised to require inspections to be performed for components associated with sentinel locations assessed in accordance with ASME Code, Section XI, Non-Mandatory Appendix L:

a. Reactor coolant system pressurizer surge line piping (hot leg elbow).
b. High pressure injection piping, stop valve-to-check valve (usage bounds high pressure injection nozzle).

<u>Operating Experience</u>

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In January 2010, an independent assessment of the ONS ISI Program was performed. A comprehensive, detailed review of the documentation (for Class 1, 2, and 3 components) was performed to determine if the required ASME Code Section XI examinations were being completed for the current ten year interval. The assessment review covered the time period of October 2007 through August 2009. There were no findings or discrepancies identified during the assessment for Oconee Unit 1, 2 or 3; but the assessment resulted in several programmatic and editorial recommendations to improve the existing ONS ISI program.

   Oconee implemented all recommendations from the assessment which resulted in several significant improvements to the ISI program such as development of an ISI program basis document to capture pertinent programmatic information. The primary purpose of the ISI program basis document is to provide a detailed technical basis for the ISI program plan. As a result, preparation and maintenance of this ISI program basis document ensures the program improvements established as a result of the assessment would be maintained throughout current and future ISI intervals.

   The ISI program basis document is a “living” document and is updated on a regular basis to ensure the ISI program plan and the ISI database reflects the current configuration of the plant and follows 10 CFR 50.55a and ASME Code Section XI requirements. An important feature of the ISI program basis document is to capture the technical knowledge and decisions made by fleet and site ISI personnel during implementation of the ISI program. Documentation of technical positions and technical assessments developed to implement the ISI program is critical to ensure that implementing details are clearly understood and maintained for current and future ISI personnel. The ISI program basis document provides a permanent location for the archival of this technical knowledge.

   OE example 1 provides objective evidence that the process of performing assessments of the ONS ISI program is effective at identifying areas for improvement and that recommendations are appropriately implemented into the program. Continued implementation of the *ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD* AMP, including performing program assessments, will ensure that the ISI program will continue to be implemented in accordance with program requirements during the SPEO.

2. In July 2012, a LR readiness assessment was performed in preparation for the NRC Phase 2 Post Approval Site Inspection for License Renewal (IP-71003 inspection). The assessment team concluded that the ONS ISI program is managing the effects of aging in accordance with commitments made during the first PEO. An area for improvement related to program oversight was identified during the assessment. As a result, clearer program ownership was established between the Duke corporate engineering team and the site regarding different aspects of the program with overall program ownership residing with corporate engineering and implementation owned by the site. The corporate and ONS site engineers now have a better understanding of how to work together collaboratively to support the ongoing effectiveness of the ISI program.

   OE example 2 provides objective evidence that the ISI program is effectively managing aging in accordance with LR commitments. In addition, this example shows that program assessments are effectively used to improve the program.

3. In November 2013, a reactor coolant system pressure boundary leak was identified at a high pressure injection line nozzle during a Unit 1 reactor building walkdown. An entry was made into the corrective action program and shutdown to Mode 5 was initiated in accordance with Technical Specifications. The leak was from a circumferential crack in the safe end-to-pipe butt weld located between the high pressure injection nozzle and the reactor coolant system loop injection block valve.

   A twenty one day outage was required to complete the initial investigation and the weld repairs. A root cause performed determined the cause was mechanical vibration-induced high-cycle fatigue which caused a through-wall crack. Contributing causes were that the system design resulted in higher than desired system vibration on the high pressure injection line and inadequate administrative guidance for conduct of augmented examinations. During analyses used to support the root cause evaluation for the safe end-to-pipe leak in the fall of 2013, the potential for flow cavitation (and subsequent erosion of the high pressure injection piping elbows immediately downstream of the in-line flow orifices) was identified. This cavitation degradation is believed to be the result of the high pressure injection full flow tests that are performed at the end of each refueling outage to verify the operation of the high pressure injection system and confirm it can deliver the required flow rates for various high pressure injection nozzle configurations. Cavitation is likely with flow rates above 100 gpm through the 0.78” orifices.

   Corrective actions were initiated to prevent recurrence including the following:

   - Leaking weld replaced
   - Increased frequency of high pressure injection piping ultrasonic inspections
   - Inspected all high pressure injection lines using diverse techniques
   - Implemented a means, in program governance procedures, to ensure the critical elements of the inspection procedures used to implement augmented inspections are incorporated into superseding procedures
   - Revised all program procedures to incorporate root cause lessons learned

   As outlined above, significant program improvements were made including increased rigor and improved basis documentation information for all augmented ISI examinations performed at ONS. These AMP improvements were made to ensure aging effects are properly evaluated and future examinations are scheduled commensurate with the safety significance of the component. The following two augmented exams were added for ONS Unit 1, 2 and 3 to manage aging effects and prevent recurrence.

- High pressure injection nozzle volumetric inspections of safe end to pipe butt welds to identify cracking.
- High pressure injection system piping elbow ultrasonic testing wall thickness measurements for wall thinning due to cavitation (NOTE: Since these examinations are required to manage the potential aging effect for cavitation erosion of the elbows just downstream of the high pressure injection flow orifices, these are included as part of the *Flow Accelerated Corrosion* AMP).

OE example 3 provides objective evidence that the corrective action program was used effectively to identify the cause of the weld failure, identify the population of welds within the extent of condition, and implement appropriate comprehensive corrective actions, including additional augmented examinations and programmatic enhancements.

4. In November 2014, during the Unit 1 outage, extent of condition ultrasonic examinations were performed based on the Unit 1 pressure boundary leak that was identified at a high pressure injection nozzle in 2013. ASME Section XI Code rejectable indications were detected on the exterior curve of the first elbow in the drain line off the Unit 1 reactor coolant system cold leg. The issue was documented in the corrective action program for evaluation and follow-up actions. The degraded condition was a 17% through-wall leak on the 1.5 inch drain line elbow due to thermal fatigue failure. Corrective actions completed included replacing the leaking elbow and adjacent piping prior to restart from the 2014 outage, performing examinations at other susceptible drain line locations, and revising program documentation to include more frequent examinations of the drain line elbows. As a result, examinations at this location are performed every refueling outage in accordance with the ONS Augmented Inservice Inspection Schedule.

   OE example 4 provides objective evidence that the inspections performed by the ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD AMP can identify degraded conditions prior to loss of intended function and that appropriate corrective actions, including component replacement, are taken when unacceptable conditions are identified.

5. In November 2017, during a Unit 2 refueling outage following reactor coolant pump and motor replacement, three linear indications were identified in a reactor coolant pump seal injection line elbow. Specifically, nondestructive examinations identified three linear indications on the 90° socket weld fitting near the nozzle connection to the reactor coolant pump seal. Two of the indications were located on the outside diameter of the fitting oriented circumferentially around the fitting. The third indication started circumferentially and transitioned to running axially towards the weld across the face of the socket weld fitting up to the toe of the weld. As a result, the weld was rejected. Two of the three indications were removed by grinding; however, one indication remained even after grinding to the maximum allowable 1/16” depth. The fitting was, therefore, cut out and replaced. A metallurgical analysis was performed and concluded that the indication of

interest was a forging lap that originated during fabrication and was not a service induced flaw. The evidence of a blunt, wide crevice tip implied that the defect was not growing.

Additional cause analysis evaluation findings are described as follows:

- The stress loading of this elbow is very low (20% of allowable). Given that, design operational loadings (as well as seismic loading) would not have initiated these linear indications.
- The evaluation concluded this was not a thermal fatigue-initiated indication.
- Reactor coolant pump operating vibration was eliminated as a potential cause since vibration induced cracking would have resulted in a through-wall crack prior to when the inspection was performed.
- The flaws identified are not associated with any service-induced degradation mechanism and are not a new degradation mechanism that would affect the categorization of this piping segment in accordance with Code Case N-716-1.

OE example 5 provides objective evidence that appropriate evaluations are performed when unacceptable indications are identified such that potential impacts on inspection scope and frequency can be properly assessed.

6. In August 2020, AMP effectiveness reviews were performed for the *Inservice Inspection* program and the *Program to Inspect the High Pressure Injection Connections to the Reactor Coolant System*. The subject ONS program aging management activities were evaluated against the performance criteria identified in NEI 14-12, *"Aging Management Program Effectiveness"*. The effectiveness reviews included augmented inspection activities as well as a review of the risk informed ISI portion of the ISI program. The review concluded that both programs are meeting the requirements of NEI 14-12. No gaps were identified during the effectiveness review.

   OE example 6 provides objective evidence that the current ISI program is effectively managing aging and meeting all current license renewal commitments. This provides reasonable assurance that ongoing program effectiveness will continue in the SPEO.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.2 WATER CHEMISTRY

Program Description

The *Water Chemistry* AMP is an existing program that mitigates aging effects of loss of material due to corrosion, cracking due to stress corrosion cracking, and related mechanisms, and reduction of heat transfer due to fouling in components exposed to a reactor coolant, steam, treated borated water, treated water or secondary feedwater environment. Chemistry programs are used to control water chemistry for parameters such as conductivity, chloride, fluoride, and sulfate that accelerate corrosion.

The scope of the primary water chemistry portion of the *Water Chemistry* AMP includes monitoring and control of the chemical environment in the reactor coolant system and related pressurized water reactor interfacing systems. The scope of the secondary water chemistry portion of the *Water Chemistry* AMP includes monitoring and control of the chemical environment in the steam generator secondary side and the secondary cycle systems. The *Water Chemistry* AMP is consistent with EPRI Report 3002000505, “Pressurized Water Reactor Primary Water Chemistry Guidelines,” Revision 7 and EPRI Report 3002010645, “Pressurized Water Reactor Secondary Water Chemistry Guidelines,” Revision 8.

The ONS primary and secondary water chemistry control strategies are set forth in strategic plans and implemented by procedures. The programmatic control of the chemical environment ensures that the aging effects due to contaminants are limited. The methods used to manage both the primary and secondary chemical environments rely on the principles of: (1) limiting the concentration of chemical species known to cause corrosion and (2) addition of chemical species known to inhibit material degradation by their influence on pH and dissolved oxygen levels.

The primary portion of the *Water Chemistry* AMP is consistent with EPRI Report 3002000505 and includes specific limits for pH, lithium, fluoride, chloride, sulfate, dissolved oxygen, and other parameters. Zinc injection is used for source term reduction in the primary systems. Control of reactor coolant and related interfacing system contaminants is maintained by using micron and submicron filters and mixed bed demineralizers, which provide mechanical filtration and ion exchange functions to remove contaminants. Filters remove corrosion products that are generated by the general equilibrium corrosion of system materials. Lithium hydroxide addition is used to control reactor coolant pH, while hydrogen addition is utilized for oxygen scavenging.

The secondary portion of the *Water Chemistry* AMP is consistent with EPRI Report 3002010645 and includes specific limits for chloride, sulfate, sodium, hydrazine, dissolved oxygen, total iron, pH, conductivity, and other parameters. Chemical control of the secondary systems is established and maintained by removing contaminants with condensate and moisture separator drain demineralizers during startup and mechanical filtration during power operations. Chemical addition of approved amines (e.g., ethanolamine-ETA), is utilized for pH control. Hydrazine is used to scavenge oxygen in secondary systems.

Water chemistry control is generally effective in areas of intermediate and high flow where mixing takes place and the monitoring samples are representative of actual conditions. For low flow areas and stagnant portions of the systems, sampling may not be as effective in determining local chemical environment conditions. A one-time inspection prior to the period of SLR of a representative group of components will provide verification of the effectiveness of the *Water Chemistry* AMP in these low flow areas. This inspection will be performed as part of the *One-Time Inspection* AMP (B2.1.20) for the verification of the effectiveness of the *Water Chemistry* AMP.

NUREG-2191 Consistency

The *Water Chemistry* AMP is an existing program that is consistent with the ten elements of NUREG-2191, Section XI.M2, Water Chemistry, as modified by SLR-ISG-Mechanical-2021-02-MECHANICAL *“Updated Aging Management Criteria for Mechanical Portions of the SLR Guidance,”* with enhancements described below.

Exception to NUREG-2191

None.

Enhancements

None.

Operating Experience

Based on a broad search of pertinent ONS OE, the following examples provide objective evidence that the *Water Chemistry* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In September 2018, ONS chemistry personnel determined that procedure steps for manual calculation of reactor coolant midband lithium were inaccurate. This procedure issue was documented in the corrective action program to evaluate and resolve through appropriate follow up actions. The chemistry procedure enclosure for manual calculation of midband lithium and action level 1 limits contained an error for desired boron value and midband calculations. The error was found when comparing the same boron values and calculations found in the ONS primary chemistry strategic plan, as required by *EPRI PWR Primary Water Guidelines*. The manual calculation procedures were not updated to reflect the most recent change to the primary chemistry strategic plan guidance.

   This issue was documented in the corrective action program for further evaluation and follow up action. The impact of the midband calculation error in current station guidance was reviewed to determine whether the calculated limits could have led to a lithium value that exceeded limits. Calculation of the reactor coolant lithium midband allows for optimum control of lithium in the reactor coolant system and is used to establish the upper and lower control limits. Since the lithium midband and limits are calculated using an automated computer program, there was no concern that any limits had been exceeded.

This manual calculation enclosure would only be used if this computer program calculation was not available.

An extent of condition was performed which determined that at no time, since the revision of the primary chemistry strategic plan, has the manual calculation procedure been used on any ONS unit to calculate the lithium midband and limits. Additional follow-up actions included:

- procedure change requests were initiated to correct the errors.
- the subject chemistry procedure enclosures were placed on hold until the procedure changes for all three units were completed.
- direction was added in the primary chemistry turnover documentation to use the calculation in the correct procedure, if required.
- notified chemistry management.

OE example 1 provides objective evidence that the corrective action program is used to evaluate and resolve technical issues to ensure AMP effectiveness. This also demonstrates that appropriate immediate actions as well as follow up actions are taken until all technical or programmatic issues are resolved.

2. In November 2018, during startup from a Unit 1 outage, feedwater sodium exceeded the EPRI Action Level 2 value of 3 parts per billion (ppb) when sodium reached a value of 3.02 ppb. A corrective action program entry was made to document the ONS secondary chemistry out-of-specification event and determine follow-up actions. Actions included entering the abnormal procedure for chemistry out of specification due to feedwater sodium levels. Other corrective actions included placing additional demineralizer filters in service to lower the system sodium and allow startup to continue. Notifications were made to appropriate operations station personnel (control room supervisor, station technical advisor, and station manager). Sampling and data trending continued until values returned to normal levels (< 1 ppb). EPRI Action Level 3 was not reached since the maximum sodium level reached was 5.68 ppb and returned to < 5 ppb in less than an hour.

   The cause of the event was determined to be main turbine maintenance practices during the refueling outage which caused a source of sodium to enter the hotwell and condenser which was then transported into the feedwater system. As a result of this event, main turbine maintenance practices were improved to ensure cleanliness and prevent impurities in systems.

   OE example 2 provides objective evidence that water chemistry parameters are monitored, and corrective actions are taken to ensure that industry guidelines and station procedural requirements are maintained.

3. In October 2019, a chemistry self-assessment was performed to review station instrument trending and commenting practices. It was determined that, in some cases, actions to resolve instrument quality control violations are not being consistently documented, as described in chemistry guidance for analytical quality control. An entry

was made into the corrective action program to document the issues found during the self-assessment.

As a result of this corrective action item, program procedure improvements were made to ensure specific documentation actions described in the chemistry procedure are completed including documenting the investigation and cause and resolution as well as documenting the status of associated sample analysis data and whether data was accepted or rejected. This program improvement item to capture causes and resolutions of instrument failure resulted in enhancing the program such that instrument failures can be diagnosed and returned to service sooner. Evaluation of the issue determined that no inaccurate analytical data was produced. Follow-up corrective actions included a recommended action to establish a standard template as a guide for when chemistry instruments fail quality control checks in order to consistently capture failure causes and resolutions. Additional corrective actions included enhancing chemistry turnover process to clearly communicated instrumentation status.

OE example 3 provides objective evidence that program issues are identified and documented in the corrective action program for further evaluation and follow up actions. This example demonstrates the corrective action program is effectively used to establish improvements to strengthen the *Water Chemistry* AMP.

4. In December 2019, Unit 2 reactor coolant boron and lithium samples were found to be outside pH_T 6.9 limit for criticality. Although primary chemistry action level 1 was not exceeded (Lithium was found to be outside of pH_T 6.9 at 3.27 ppm), the issue was documented in the corrective action program to evaluate and determine follow up corrective actions. Corrective actions included the following:

   - re-sampling of boron and lithium.
   - lithium recheck was validated.
   - cause evaluation performed (the marginal drop between samples determined to be the normal purification demineralizer not being at equilibrium with Unit 2 reactor coolant system).
   - lithium addition to the Unit 2 letdown storage tank initiated to bring lithium back above pH_T 6.9.

   OE example 4 provides objective evidence that water chemistry parameters are monitored, and appropriate immediate and follow up corrective actions are taken to ensure that industry guidelines and station procedural requirements are maintained.

5. In January 2020, a chemistry training self-assessment was performed to review chemistry personnel qualifications and the effectiveness of qualification guides. This resulted in several training improvements for training related to silica analysis, secondary dissolved gas analysis and sodium analysis. This issue was entered into the corrective action program for further evaluation and follow up action. Additional corrective actions included an improvement of the qualification card to evaluate task prerequisite knowledge previously taught in chemistry fundamentals. This corrective action led to an improvement

in chemistry qualification fundamental training to include tasks such as silica analysis, secondary dissolved gas sampling and sodium analysis.

OE example 5 provides objective evidence that assessments are periodically performed for the *Water Chemistry* AMP and that the corrective action program is effectively used to evaluate and implement program improvements when appropriate.

6. In August 2020, an AMP effectiveness review of the Water Chemistry AMP was performed. The AMP was evaluated against the performance criteria identified in NEI 14-12, *"Aging Management Program Effectiveness."* The review concluded that the Water Chemistry program is meeting the requirements of NEI 14-12. No gaps were identified during the effectiveness review.

   This effectiveness review provides objective evidence that the current Water Chemistry program is effectively managing aging and meeting all current license renewal commitments. This provides reasonable assurance that ongoing program effectiveness will continue in the subsequent period of operation.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Water Chemistry* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, re-evaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Water Chemistry* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

<u>Conclusion</u>

The implementation of the *Water Chemistry* AMP provides reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.3 REACTOR HEAD CLOSURE STUD BOLTING

Program Description

The *Reactor Head Closure Stud Bolting* AMP is an existing condition monitoring and preventive program that includes ASME Code, Section XI examinations of the reactor head closure stud assembly (closure studs, nuts and washers) and the threads of the reactor vessel flange to manage cracking and loss of material. The *Reactor Head Closure Stud Bolting* AMP is implemented as part of the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* (B2.1.1) AMP. The program is consistent with the examination and inspection requirements specified in ASME Code, Section XI, Subsection IWB, Table IWB-2500-1. The extent and schedule for examining and testing the reactor head closure stud bolting components is specified in Table IWB-2500-1 for B-G-1 components, "*Pressure Retaining Bolting Greater than 2 Inches in Diameter*."

The *Reactor Head Closure Stud Bolting* AMP implements ASME Code, Section XI inspection requirements through the ONS ISI program plan. The current Inservice Inspection Program for the fifth 10 year inspection interval is based on the 2007 ASME Code, Section XI, including 2008 addenda. Future 120 month inspection intervals will incorporate the requirements specified in the version of the ASME Code referenced in 10 CFR 50.55a twelve months before the start of the Inservice Inspection interval. The *Reactor Head Closure Stud Bolting* AMP includes preventive measures to address reactor head closure stud bolting degradation consistent with those identified in the RG 1.65, Revision 1, "Material and Inspection for Reactor Vessel Closure Studs."

The *Reactor Head Closure Stud Bolting* program uses visual and volumetric examinations in accordance with the general requirements of ASME Code, Section XI, Article IWA-2000. The reactor vessel head closure studs and threads in the reactor vessel flange receive a volumetric examination (with exceptions as allowed by NRC approved relief requests to eliminate volumetric examinations of the flange threads during the fifth inspection intervals), and the surfaces of nuts and washers at the reactor vessel flange are inspected using a visual examination (VT-1). The reactor vessel flange connection is within the ASME Code Class 1 pressure-retaining boundary that receives a visual examination (VT-2) per Exam Category B-P during the system leakage test that is performed during each refueling outage.

The reactor head closure stud materials (including nuts, washers and spares) are fabricated from ASTM A-540, Grade B23 alloy steel, Class 3 (ASME Code Case 1335-2) which requires a minimum yield strength of 130 ksi and a minimum tensile strength of 145 ksi. As a result, the installed and spare reactor head closure studs, nuts, and washers (and spares) may have strength values that could exceed the RG 1.65 limits of 150 ksi (yield strength) and 170 ksi (ultimate tensile strength).

Based on Certified Material Test Report data, the installed Unit 1 and Unit 2 studs, nuts, and washers are fabricated with material that may have ultimate tensile strength greater than or equal to 170 ksi. The Unit 3 stud materials are fabricated with material that has a measured ultimate tensile strength less than 170 ksi. The Certified Material Test Report documentation for all fifteen spares indicates an average measured yield strength of greater than 150 ksi. As a result, all installed studs on Unit 1 and 2 and all spare reactor head closure studs present a potential concern for stress corrosion cracking based on the limits stipulated in RG 1.65. The *Reactor*

Head Closure Stud Bolting AMP includes other preventive measures described in RG 1.65 to prevent cracking. Preventive measures for the program include the following attributes:

- Metal-plated stud bolting is not used, which could cause degradation due to corrosion or hydrogen embrittlement;
- A phosphate surface treatment was applied to the studs, nuts, and washers during fabrication to inhibit corrosion; and
- An approved stable lubricant is applied to the studs, nuts, and washers whenever the reactor head is installed. The lubricant used does not contain molybdenum disulfide which has been shown to be a potential contributor to stress corrosion cracking.

To address the potential for SCC for the reactor head closure studs that are installed, ultrasonic examinations are performed during each ASME Code, Section XI, inspection interval. For the spare studs that have strength values that could exceed the RG 1.65 limits of 150 ksi (yield strength) and 170 ksi (ultimate tensile strength), the potential for SCC will not be a concern unless those spares were to be placed into service. At that time, the potential for SCC will be addressed by the ultrasonic examinations which continue to be performed in accordance with ASME Code, Section XI.

Any indication of degradation in reactor head closure stud bolting is documented in the corrective action program and evaluated in accordance with ASME Code, Section XI, Subsection IWB-3100 for Class 1 components by comparing ISI results with the acceptance standards of IWB-3400 and IWB- 3500. Flaw indications or relevant degraded conditions are evaluated in accordance with IWB-3515 or IWB-3517 as indicated in Table IWB-2500-1 and Table 3410-1 of ASME Code, Section XI.

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program will continue to include volumetric examination per ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1 and, therefore, will continue to be effective in managing cracking during the SPEO for existing studs and for spare studs upon installation.

<u>NUREG-2191 Consistency</u>

The *Reactor Head Closure Stud Bolting* AMP is an existing program that is consistent with the ten elements of the NUREG-2191 Chapter XI.M3, *Reactor Head Closure Stud Bolting*, with the exceptions and enhancements listed below.

<u>Exception 1 to NUREG-2191</u>

Program Element Affected: Preventive Actions (Element 2)

1. NUREG-2191 indicates in Chapter XI.M3, *Reactor Head Closure Stud Bolting*, that the program relies on the recommendations of RG 1.65, Revision 1, April 2010. RG 1.65, Revision 1, which recommends that actual measured yield strength should not exceed 150 ksi for newly installed studs or 170 ksi ultimate tensile strength for existing studs.

The ONS installed and spare reactor head closure studs were not procured under specifications that limited the measured maximum yield and ultimate tensile strengths, which may present a concern for SCC.

For installed studs, Certified Material Test Reports for the materials used for fabrication of the existing ONS reactor head closure studs installed on Unit 1 (Heat Number 6780366) and Unit 2 (Heat Number 6880366) include some test results indicating that the installed studs may have ultimate tensile strength greater than or equal to 170 ksi. Certified Material Test Reports for materials used for fabrication of existing reactor head closure studs installed on Unit 3 (Heat Number 159628) indicate ultimate tensile strength of less than 170 ksi for all materials.

For newly installed studs, there are twelve spare studs from Heat Number 6780366 and three spare studs from Heat Number 159628 that may have measured yield strength of greater than 150 ksi.

Therefore, the ONS program takes exception (on Unit 1 and 2 only) to the recommendation that existing installed studs' ultimate tensile strength should not exceed 170 ksi, and for newly installed studs (for all fifteen spare stud materials) on any unit, the program takes exception that newly installed studs should not exceed 150 ksi.

Justification for Exception 1

The ONS reactor vessels are designed in accordance with the ASME Boiler and Pressure Vessel Code, Section III, 1965 edition with Summer 1967 Addenda. The design requirement for this bolting material is for the average Charpy V impact energy to be greater than 30 ft-lbs. The materials used to fabricate all installed stud bolting components meet this design requirement.

Although the ONS Unit 1 and 2 studs do not strictly satisfy the threshold limits of 170 ksi ultimate tensile strength for installed studs (reported threshold limit where stress corrosion cracking may be a concern), only 6 of 16 ultimate tensile strength test results reported on the ONS Certified Material Test Reports for the material heats used for Units 1 and 2 studs are greater than 170 ksi. The average of all the ultimate tensile strength test results for Oconee Unit 2 installed studs is 169.9 ksi and the average for the Unit 3 installed studs is 164.8 which are both below the threshold of 170 ksi. Only Unit 1 installed studs have an average of greater than 170 ksi (average 172.9 ksi), and while Unit 1 Certified Material Test Reports stud data revealed an average of 172.9 ksi (172,886 psi), the maximum Rockwell C (R_C) hardness value for the Unit 1 studs was reported as 36 R_C which is less than the EPRI NP-5769, *Degradation and Failure of Bolting in Nuclear Power Plants*, Volume 2 threshold of 41 R_C below which stress corrosion cracking does not present a concern.

The following Certified Material Test Reports data is summarized below for the studs on each ONS Unit:

Unit 1

Only 3 out of 8 ultimate tensile strength test results reported on the Certified Material Test Reports for the heat number used for the Unit 1 studs are greater than 170 ksi. The average of all the measured ultimate tensile strength test results for the Unit 1 studs is 172.9 ksi. This data applies to all 60 installed Oconee Unit 1 studs.

Unit 2

Only 3 out of 8 ultimate tensile strength test results reported on the Certified Material Test Reports for the heat number used for the Unit 2 studs are greater than 170 ksiksi. The average of all the measured ultimate tensile strength test results for the Unit 2 studs is 169.9 ksi. This data applies to all 60 Oconee Unit 2 installed studs.

Unit 3

None of the values for the ultimate tensile strength test results reported on the Certified Material Test Reports for the heats used for the Unit 3 studs are greater than or equal to 170 ksi. The average of all the measured ultimate tensile strength test results for the Unit 3 studs is 164.8 ksi. This data applies to all 60 Oconee Unit 3 installed studs.

Nuts and Washers for Units 1, 2, and 3:

None of the values for the ultimate tensile strength test results are greater than 170 ksi. The average of all measured ultimate tensile strength test results (for the nuts and washers) is 154.8 ksi. The average measured yield strength for the nuts and washers is 144.95 ksi.

Spare Studs:

All fifteen spare studs (potential newly installed studs) may exceed the measured yield threshold of 150 ksi. For twelve spare studs, the average maximum reported yield strength is 153.3 ksi, and for three spare studs, the average maximum reported yield strength is 150.9 ksi.

All other preventive measures listed in NUREG-2191 Chapter XI.M3, *Reactor Head Closure Stud Bolting* that reduce the potential for cracking are met, including the following:

- Metal-plated stud bolting is not used, which could cause degradation due to corrosion or hydrogen embrittlement;
- A phosphate surface treatment was applied to the studs, nuts, and washers during fabrication to inhibit corrosion;
- An approved stable lubricant is applied to the studs, nuts, and washers whenever the reactor head is installed. The lubricant used does not contain molybdenum disulfide which has been shown to be a potential contributor to stress corrosion cracking.

The *Oconee Reactor Head Closure Studs* AMP includes the ISI examinations required by ASME Section XI to detect cracking, loss of material, and leakage.

The ONS program includes periodic examination of studs, nuts, and washers; and visual leakage examinations during system pressure tests. Pressure boundary retaining components in examination category B-P receive a visual examination (VT-2) during system leakage tests.

Ultrasonic examinations are performed for installed reactor head closure studs each inspection interval, in accordance with ASME Code, Section XI, to address the potential for stress corrosion cracking. Any indication of degradation in closure stud bolting is documented in the corrective action program and evaluated in accordance with ASME Code, Section XI, Subsection IWB-3100 by comparing ISI results with the acceptance standards of ASME Code, Section XI, Subsections IWB-3400 and IWB-3500. There have been no cracking indications identified by ONS ISI program examinations of reactor head closure bolting components, indicating that the current program has been effective to manage cracking.

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program will continue to include volumetric examination per ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1 and, therefore, will continue to be effective in managing cracking during the SPEO for existing studs and for spare studs upon installation. EPRI Report 3002014589, *“Technical Basis for Optimization of the Volumetric Examination Frequency for Reactor Vessel Studs”* states that cracking has only been confirmed at only one plant, a BWR. Ultrasonic testing indications indicative of cracking have been detected at two other BWR plants, one of which was determined to be general corrosion rather than cracking. There has been no reported cracking of reactor vessel head closure studs at PWR plants.

Exception 2 to NUREG-2191

Program Element Affected: Corrective Actions (Element 7)

2. NUREG-2191 recommends, as a corrective action that can reduce the potential for stress corrosion cracking, the maximum measured yield strength of replacement material should be limited as recommended in RG 1.65, Revision 1. RG 1.65, Revision 1 specified that the material used for closure studs and nuts have measured yield strength less that 150 ksi.

The spare (potential replacement) reactor head closure studs (currently, 15 spares are stored in a warehouse at ONS) are fabricated from SA-540 Grade B23 alloy steel which requires a minimum yield strength of 130 ksi and a minimum tensile strength of 145 ksi. The Certified Material Test Report data for the spare studs includes several sets of test results that include yield strength data for each heat used to fabricate the studs.

Certified Material Test Reports for the materials used for fabrication of the potential replacement reactor head closure studs in the warehouse include test results with measured yield strength greater than or equal to 150 ksi. Twelve spare studs have an average maximum reported yield strength of 153.3 ksi and three spare studs have an average maximum reported yield strength of 150.9 ksi. Therefore, all fifteen potential newly installed studs may exceed the threshold of 150 ksi where stress corrosion cracking may be a concern

Justification for Exception 2

Oconee Unit 1, 2 and 3 reactor vessel stud bolting materials were fabricated in a manner consistent with the recommendations of the RG 1.65. Potential replacement reactor head closure studs and nuts already procured and stored in the warehouse slightly exceed the strength criteria of 150 ksi measured yield strength.

Although the potential newly installed stud components may exceed the 150 ksi yield strength threshold, all other preventive measures listed in NUREG-2191 Chapter XI.M3, *Reactor Head Closure Stud Bolting* that reduce the potential for cracking are met, including the following:

- Metal-plated stud bolting is not used, which could cause degradation due to corrosion or hydrogen embrittlement;
- A phosphate surface treatment was applied to the studs, nuts, and washers during fabrication to inhibit corrosion;
- An approved stable lubricant is applied to the studs, nuts, and washers whenever the reactor head is installed. The lubricant used does not contain molybdenum disulfide which has been shown to be a potential contributor to stress corrosion cracking.

Volumetric inspections will be performed on the ONS installed studs, in accordance with ASME Code, Section XI, each inspection interval to detect any indication of cracking. If any of the spare studs are installed, any indication of degradation in the newly installed closure stud bolting will be evaluated in accordance with ASME Code, Section XI, Subsection IWB-3100 by comparing ISI results with the acceptance standards of ASME Code, Section XI, Subsections IWB-3400 and IWB-3500.

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program will continue to include volumetric examination per ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1 and, therefore, will continue to be effective in managing cracking during the SPEO for existing studs and for spare studs upon installation.

Enhancements

The following enhancements will be implemented in the following program elements:

Preventive Actions (Element 2) and Corrective Actions (Element 7)

1. Procurement requirements for reactor head closure stud bolting will be revised to incorporate guidance from RG 1.65, Revision 1 and NUREG-2191, Chapter XI.M3, to ensure newly procured bolting material does not exceed the limit for maximum measured yield strength of 150 ksi and measured ultimate tensile strength of 170 ksi.

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Reactor Head Closure Stud Bolting* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In April 2011, an entry was made into the corrective action program to document the engineering evaluation of the indications identified on the Unit 1 reactor vessel head studs and washers. The following Unit 1 reactor vessel studs and washers were identified as having minor damage to threads or load bearing surfaces:

   - One stud had minor scratches in two locations on upper portion of threads;
   - One stud had a gouge on upper starter thread, scratch across six threads near top, and 1.5 inches of lower starter thread missing; and
   - One washer had minor indentations on the load bearing portion of the upper surface. These indentions were dressed in a whetstone to remove any raised metal.
   - Several other washers exhibited minor pitting on the non-load bearing surfaces.

   The minor damage noted on the washers above was determined to be acceptable for continued use since the condition will not impair the washers from performing their function and as a result, are acceptable, as-is. The damage noted on the two studs above was evaluated against the guidance in vendor calculation for the Evaluation of Oconee Units 1, 2, and 3 reactor vessels bolting. The evaluation determined that these studs are acceptable for continued use since the minor scratches and damage will not impact the studs from performing their component intended function.

   OE example 1 demonstrates that the reactor head closure stud bolting components (including washers) are inspected in accordance with ASME Code Section XI requirements using examination techniques that would identify cracking and loss of material and any potential adverse conditions are entered into the corrective action program.

2. In March 2013, a corrective action item was initiated for a program performance gap review to be performed for Regulatory Issue Summary 2011-05, *"License Renewal Aging Management Program comparison against Generic Aging Lessons Learned,"* Revision 2 to review key updates and changes to NUREG-1801, *"Generic Aging Lessons Learned (GALL) Report",* Revision 2, issued December 2010. The RIS summarized the significant updates to aging management guidance, detailed in Revision 2 of NUREG-2191, which included a revision to Chapter XI.M3, "*Reactor Head Closure Stud Bolting*."

   The revision to Chapter XI.M3, *"Reactor Head Closure Stud Bolting"* updated the program to include the more appropriate yield strength designation for high-strength bolts, which reflects information in the reference document, NUREG-1339, *"Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Plants,"* issued June 1990. In addition, the revision specifically identified that molybdenum disulfide is a potential contributor to stress corrosion cracking and should not be used. The two identified updates to NUREG 2191 Chapter XI.M3, *"Reactor Head Closure Stud Bolting"* are related to:

   - Limits on actual measured yield strengths for the bolting material, and
   - The non-allowance of the use of molybdenum disulfide (MoS2) as a lubricant.

   Engineering performed a gap evaluation for ONS to review key updates to the NUREG-2191 Chapter XI.M3 program. Specifically, the following actions were performed as part of the engineering evaluation:

   - Reviewed certified material test reports for the studs and nuts at the site for each unit to obtain actual yield strength and hardness values (this information was found in the receipt inspection package associated with each reactor vessel).
   - Determined that ONS reactor head closure studs, nuts and washers are A-540, Grade B23 (Code Case 1336) and that ONS studs, nuts and washers do not strictly satisfy the 150 ksi limit on yield stress which is reported as the threshold limit where SCC may be a concern.
   - Reviewed the following applicable industry reports to determine:
     - NUREG-1339 specifies a yield strength limit of 150 ksi. Where material yield strength is less than this value, there are no concerns with a SCC failure mechanism
     - EPRI Report NP-5769, Volume 2, page 7-16, indicates that bolting materials with a hardness level of 41 R_C and lower (equivalent Brinell hardness < 388) present no concerns with SCC.
     - EPRI MRP-150, Materials Handbook for Nuclear Plant Pressure Boundary Applications (2013) which states the use of lubricants containing sulfur or chlorine may increase potential for stress corrosion cracking.
   - Performed a review of external OE including past and current plant maintenance practices and ASME code inspection requirements which revealed SA-540 Grade

B23 and B24 bolting material is not generally susceptible to SCC unless compounded with other detrimental factors.

- An internal OE search was done for the Duke sites for SA-540, SA540 or AISI 4340 which revealed no failures associated with this material.
- An additional search of external OE indicates no failures associated with SA-540 materials. Studs and nuts are volumetrically examined (Ultrasonic Test) each inspection interval. These examinations are distributed between the three inspection periods per interval.
- Determined that although use of molybdenum disulfide products were used at ONS in the past, plant procedures have eliminated the use of these lubricants and no cracking indications have been identified on any studs.
- The studs and nuts at ONS are machine cleaned and relubricated each refueling outage.

The engineering review concluded that since the studs, nuts and washers on each unit at ONS are visually examined each refueling outage, a flaw would be identifiable by this examination. In addition, the identification of an indication exceeding ASME Section XI code acceptance limits would require additional examinations during the refueling outage of discovery. Also, as part of ongoing program procedures, continued external OE would be reviewed to determine if additional actions are needed in the future.

OE example 2 provides objective evidence that the corrective action program is effectively used to evaluate OE, including regulatory guidance updates, to inform and enhance AMPs. This demonstrates that appropriate actions are taken to evaluate technical issues to ensure ongoing program effectiveness.

3. In December 2013, an entry was made to the corrective action program to evaluate required actions and document receipt of *EPRI Nondestructive Evaluation Program Letter 2013 - 09, ALERT: Notification of Noncompliance Performance Demonstration Initiative (PDI) - Implementation of Bolting Qualifications not in compliance with ASME Code, Appendix VIII*, Supplement 8, dated December 18, 2013. The EPRI Performance Demonstration Initiative is an industry effort to promote rigor, consistency, and effectiveness in ultrasonic non-destructive evaluation technology. The EPRI Performance Demonstration Initiative bolting qualification program is intended to provide an acceptable method for completing the examinations.

   In the Fall of 2013, as documented in this corrective action item and RIS 2015-01, discrepancies between the ASME Section XI Appendix VIII, Supplement 8 (prior to 2015 edition) requirements and the PDI bolting qualification program were identified during a program internal audit. ASME Section XI, Appendix VIII, Supplement 8 provides the requirements for the examination and acceptance of safety classes 1 and 2, pressure retaining bolting greater than 2.0 inches in diameter. The specific bolting locations affected on Oconee Units 1, 2, and 3 included the reactor vessel closure studs. ASME Code Section XI, Appendix VIII, Supplement 8 requires full-scale section bolt or stud specimens containing the beam path be used to demonstrate scanning techniques. Specifically, Supplement 8 requires the qualification specimen “be of similar chemical composition, tensile properties, and metallurgical structure as the bolt or stud to be examined” and that the scan surface of the qualification specimen have a configuration similar to the bolt or stud to be examined. This requirement is unlike other supplements in Appendix VIII that allow the use of a range of configurations that represent “typical” conditions for demonstrating scanning techniques. EPRI, as administrator of the Performance Demonstration Initiative program, used mockups technically representative of bolt and stud configurations and material types known to exist in the fleet. These representative mockups may not have met the Supplement 8 requirements for all cases for which the mockups were used.

EPRI performed a technical evaluation and determined that examinations performed in accordance with the requirements of the Performance Demonstration Initiative qualified bolting examination procedures would provide the licensee reasonable assurance that flaws of safety significance would have been detected consistent with the intent of the Code requirements. Therefore, while the Performance Demonstration Initiative qualification procedure does not strictly comply with ASME Section XI, Appendix VIII, Supplement 8, the differences identified do not degrade a reasonable assurance of operability.

Although there was no operability concern, Oconee reperformed volumetric examinations on all reactor pressure vessel studs on all three units. The exams were performed in accordance with the blind demonstration requirements and mockup requirements. Oconee reinspected all reactor pressure vessel studs with satisfactory results in the next outage for each unit. There were no relevant indications from any of the Oconee inspections performed on Units 1, 2, or 3.

OE example 3 provides objective evidence that industry OE and updates are documented, reviewed and evaluated in the corrective action program. This example also demonstrates that reactor head closure stud bolting components are inspected in accordance with ASME Code Section XI requirements using examination techniques that would identify cracking and loss of material. The reactor head closure stud bolting components were verified to be in good material condition.

4. In April 2016, during the inspection and cleaning of the Unit 3 reactor head studs, nuts and washers, minor wear was identified on the mating surface of a reactor head stud washer. The issue was documented in the corrective action program to evaluate as a potential indication and determine corrective actions. Maintenance took photographs of this damage and contacted engineering to perform an evaluation. Engineering concluded that the outer indications were outside the region of the washer that is loaded and would not impact the ability of the washer to perform its function. In addition, engineering determined the smaller wear indication toward the inner radius of the washer exhibits no raised metal which would interfere with proper loading of the washer to nut interface. For those reasons, the reactor vessel stud washer was evaluated as acceptable for continued use and returned to service.

   OE example 4 demonstrates that the reactor head closure stud bolting components (including washers) are inspected in accordance with ASME Code Section XI requirements using examination techniques that would identify cracking and loss of material and any potential adverse conditions are entered into the corrective action program and appropriately evaluated by engineering.

5. In August 2020, an AMP effectiveness review was performed for the ISI Program (UFSAR Section 18.3.12) including a review of activities for the reactor head closure stud bolting inspections. The ISI program aging management activities were evaluated against the performance criteria identified in NEI 14-12, “Aging Management Program Effectiveness.” The review concluded that the ISI program is meeting the requirements of NEI 14-12. No gaps were identified during the effectiveness review related to reactor head closure stud bolting activities.

   OE example 5 provides objective evidence that the current ISI program is meeting all current license renewal commitments and effectively managing aging effects of reactor head closure stud bolting components in accordance with ASME Section XI requirements. This provides reasonable assurance that ongoing program effectiveness will continue in the subsequent period of operation.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Reactor Head Closure Stud Bolting* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, re-evaluation, repairs, performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Reactor Head Closure Stud Bolting* AMP, with noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.4 BORIC ACID CORROSION

Program Description

The *Boric Acid Corrosion* AMP is an existing condition monitoring program that manages loss of material due to leaking borated water on external surfaces of structures and components (including electrical equipment/junction boxes) within the scope of SLR that are susceptible to boric acid corrosion. The program applies to susceptible components in the reactor building and auxiliary building where boric acid leakage is a concern. The program includes provisions to identify leakage through inspection and examination. When leakage is identified, a visual inspection is performed that identifies the leakage pathway and any boron deposits on adjacent structures, components, and supports so that leakage cleanup can begin, and corrective actions can be initiated, as necessary. When it is determined that an evaluation is necessary, it is performed in a timely manner. Follow up inspections may be performed to ensure that the corrective actions were adequate and addressed the identified age related degradation.

The *Boric Acid Corrosion* program relies, in part, on GL 88-05, *"Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants,"* for guidance to identify, evaluate, and correct borated water leaks that could cause corrosion damage to reactor coolant pressure boundary components. Borated water leakage from components outside the scope of the program established in response to GL 88-05 may affect other components within the scope of SLR. Therefore, this program includes components within the scope of SLR exposed to an air environment with potential borated water leakage that are susceptible to boric acid corrosion.

The *Boric Acid Corrosion* program is consistent with both GL 88-05 as well as Section 7 of WCAP-15988-NP, Revision 2, *"Generic Guidance for an Effective Boric Acid Inspection Program for Pressurized Water Reactors".* Additionally, the *Boric Acid Corrosion* program interfaces with the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program (B2.1.1) which includes ISI pressure tests performed in Accordance with ASME Code, Section XI requirements. These interfaces with other site programs and activities ensures that borated water leakage that is encountered by means other than this program is evaluated and corrected. Specific attributes from WCAP-15988-NP are addressed in implementing procedures, and are included in, but not limited to, the following listing:

- The program is established and implemented in accordance with regulatory commitments, and mandatory and recommended industry requirements.
- The program identifies inspection locations that are susceptible to potential borated water leakage. Susceptible materials for boric acid corrosion include carbon steel, low-alloy steel, and cast iron; Inconel alloy base metal and welds (due to Primary Water Stress Corrosion Cracking); and certain copper alloys (containing >15% zinc).
- Locations that are susceptible to boric acid corrosion are inspected by programs other than the *Boric Acid Corrosion* program. The effects of boric acid corrosion on reactor coolant pressure boundary materials in the vicinity of nickel alloy components are managed by the *Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components* (B2.1.5) AMP. Bare metal visual examinations that are described in the *Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components* (B2.1.5) program determine the

presence of borated water leakage on the reactor vessel upper head penetration nozzles and the bottom-mounted instrumentation nozzles. Interfaces with the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* (B2.1.1) program include results from visual inspections for loss of material due to boric acid corrosion.

- Program ownership and responsibility is established which includes personnel qualification and appropriate *Boric Acid Corrosion* program training. Visual inspections are performed by qualified individuals who are tasked with performing focused inspections for boric acid leakage. Also, computer based training is provided to individuals who may observe evidence of borated water leakage. Evidence of borated water leakage exists as the presence of boron deposits or moisture. Discolored boron deposits may be an indication of potential boric acid corrosion.
- Routine walkdowns, performed each day by plant operators and radiation protection personnel note any evidence of borated water leakage. Additional plant walkdowns are performed by engineering. Focused inspections are performed during refueling outages by operations and engineering personnel to identify evidence of borated water leakage.
- Results of inspections to identify occurrences of borated water leakage during refueling outages are documented in the corrective action program. Any borated water leakage evaluated and additional actions are taken to remediate the leakage.
- Any obstructions to visual inspection are removed for inspection, unless a technical justification for not performing the visual inspection is documented. For leakage examinations of borated systems components with external insulation, or for joints that are not visible due to being located under insulation, the surrounding areas of the floor, equipment surfaces, or exposed surfaces of the insulation are examined for evidence of borated water leakage. An initial inspection determines the extent of insulation removal that is required in order to properly perform the examination for evidence of leakage. In some situations (such as for bolted connections which are within the scope of ASME Section XI), removal of insulation may be required in order to perform the borated water leakage inspection. For leakage at an insulated bolted connection in a system that is borated for purposes of reactivity control, the bolting is evaluated by engineering, as necessary, in accordance with ASME Section XI, Subsection IWA 5250 and Code Case N-566-2, “Corrective Action for Leakage Identified at Bolted Connections.”
- The *Boric Acid Corrosion* program identifies sources of borated water leakage, and the pathway and potential targets (i.e., adjacent structures and components) that could be adversely affected by borated water leakage. OE has shown that likely locations for borated water leakage include valve packings, body to bonnet gaskets, bolted connections, and fittings.
- Screening, evaluating and dispositioning leaks including data collection and documentation including appropriate corrective and mitigating actions. Leakage that exceeds the screening threshold identified in the *Boric Acid Corrosion* program requires initiation of an engineering evaluation. Engineering evaluations are performed to determine the impact of leakage on the integrity of the borated system pressure boundary or adjacent structures and components. Engineering evaluations determine whether degradation of susceptible structures or components has occurred, whether repair or replacement of structures or components (perhaps using

corrosion resistant materials) is needed, or whether the observed condition is acceptable without repair.

- Program inspections are performed inside containment to look for evidence of boron deposits on components such as control rod drive mechanisms and fans, containment air recirculation fan coils and reactor building cooling units. In addition, to identify potential borated water leaks inside containment that have not been detected during walkdowns and maintenance, the program also requires a collective significance review to be performed which reviews attributes to assist with identification of potential borated water leaks inside containment. These attributes include, but are not limited to, indications from reactor coolant system water inventory balancing, containment air cooler thermal performance, containment air particulate radiation monitors, containment noble gas radiation monitors, containment humidity and temperature monitors and air filter change out frequency and appearance of filter at change out (e.g., for boric acid or reddish-brown color which may be an indication of corrosion).
- The program is periodically assessed to determine program compliance with established processes, procedures, and requirements to ensure ongoing program effectiveness. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

<u>NUREG-2191 Consistency</u>

The *Boric Acid Corrosion* program is an existing program that is consistent with NUREG-2191 Chapter XI.M10, Boric Acid Corrosion.

<u>Exception to NUREG-2191</u>

None

<u>Enhancements</u>

None

<u>Operating Experience</u>

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Boric Acid Corrosion* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In May 2012, a fleet wide focused self-assessment was performed, to review VT-2 visual inspection documentation and evaluation adequacy. The purpose of the assessment was to review ASME Code compliance, site program procedure compliance and effectiveness, and documentation adequacy regarding the performance of boric acid

engineering evaluations on bolting materials exposed to borated water leakage. The assessment reviewed the following:

- Compliance with ASME Code requirements related to leakage examination,
- Appropriate ASME Code actions were taken when leakage was discovered, and
- Adequacy of ASME Code Case N-566-2 evaluations when that option was used.

The assessment team identified several improvements to program processes and procedures. Corrective actions were generated to address all assessment recommendations. All corrective actions were completed which resulted in several programmatic improvements to the program including improved procedures for boric acid engineering evaluations and required actions when borated water leakage is identified.

OE example 1 provides objective evidence the program is periodically assessed to determine program compliance with established processes, procedures, and requirements to ensure ongoing program effectiveness. This provides reasonable assurance that plant OE will be used to ensure program effectiveness in the SPEO.

2. In March 2013, during remote video inspection of the Oconee Unit 1&2 purification and deborating demineralizer room, boron deposits were discovered on and around the demineralizer. A corrective action entry was made to document and evaluate the borated water leakage. In accordance with the *Boric Acid Corrosion* program, engineering performed a boric acid evaluation to determine the extent of any borated water leakage and establish follow-up corrective actions. The source of the leak was the manway gasket on the top of the demineralizer. The leak did not appear active at the time of the video inspection performed in June 2013. The boric acid corrosion evaluation identified all source and target materials and estimated corrosion rates based on the borated water leakage condition. Once engineering documented the borated water leakage (identified source and target components), the boron was cleaned from all affected components to perform a more thorough inspection of the carbon steel manway gasket bolting components

   Based on existing degradation and projected conservative estimated corrosion rates, the engineering evaluation determined that sufficient margin exists to ensure intended functions are maintained through the initial period of extended operation (i.e., through 2033). Corrosion rates are expected to be low, even for continuously wet conditions, due to the low temperature environment. Engineering determined that the bolting on the manway is expected to have over 10 times the required capacity at the end of the initial period of extended operation. This room is a highly contaminated area that cannot routinely be entered for inspection. A preventive maintenance activity was created as a follow up action to periodically monitor the condition and review expected corrosion rates to ensure aging effects will continue to be managed.

   OE example 2 demonstrates that the corrective action program is effectively used to initiate appropriate actions including actions to identify borated water leakage and evaluate boric acid corrosion. This provides reasonable assurance that plant OE will be used as a feedback mechanism to ensure aging effects are managed in the SPEO.

3. In July 2014, a fleet self-assessment was performed to evaluate the *Boric Acid Corrosion* AMP against industry standards, strengths, and good practices, and to determine procedural and regulatory compliance. The fleet program documents were evaluated against regulatory commitments and guidance, as well as NEI 03-08 and WCAP-15988-NP industry requirements. Other aspects of the self-assessment were to determine whether boric acid leakage is promptly identified and documented in the corrective action program, to determine whether boric acid leakage evaluations are performed and documented in a timely manner, to determine whether minor leaks are cleaned and regularly monitored for change in condition, and to determine whether safety significant/ excessive leakage is corrected/mitigated in a timely manner. Procedure compliance, inspections of infrequently accessed areas, trending processes and training qualifications and certifications were also reviewed.

   No issues were identified with respect to compliance with industry program guidance documents. The self-assessment confirmed that all required program functions are being completed effectively and no gaps were identified. The team found several examples where clarification of existing program procedure, training, and administrative documentation details could be enhanced, and other opportunities to apply industry best practices for program improvement. Improvements implemented included program procedure revisions to enhance infrequently accessed area inspections. Maintenance procedures were revised to add a step to look for borated water leakage accumulations in the letdown filter pits and to generate work requests, as necessary, for leak repair and evaluation. A new preventive maintenance activity was also added to periodically lift the borated water storage tank trench covers and inspect the trench for boric acid deposits or corrosion deposits on a two-year frequency. Other improvements implemented included enhancements to the general employee boric acid training module such as more examples and information on the potential consequences of leaks, boric acid inspector module improvements, and other information added to improve general awareness of borated water leak identification.

   OE example 3 provides objective evidence that the Boric Acid Corrosion program is effectively managing aging by ensuring program effectiveness through self-assessments.

4. In October 2014, a site-specific assessment was conducted to independently review the quality of ONS boric acid corrosion engineering evaluations to identify any gaps and ensure compliance with regulatory commitments as well as plant and industry guidance. Documentation of the review results were documented in the corrective action program. A review of a sample of six evaluations performed during the operating cycle confirmed that all procedure requirements have been met and no discrepancies were identified. The engineering independent assessment confirmed that ONS boric acid corrosion evaluations are being completed effectively in accordance with plant, industry and regulatory requirements.

   OE example 4 provides objective evidence that the *Boric Acid Corrosion* AMP includes periodic self-assessments to critically assess program compliance which provides reasonable assurance that ongoing program effectiveness will be maintained in the SPEO.

5. In July 2016, a fleet wide focused self-assessment of the Boric Acid Corrosion program was conducted. Areas reviewed included borated water leak identification from multiple site organizations, inspection rounds and walkdowns, adequacy of leak identification documentation, corrective action program entry and timeliness, elapsed time between leak discovery and leak screening, screening process adequacy, active leak containment, borated water deposit/residue cleaning, periodic leak monitoring, and maintenance resolution of borated water leakage issues.

   The assessment team identified one area for improvement for ONS, and eight recommendations to enhance the overall fleet program. There were no cross-functional problems or program performance objective failures. The area for improvement was identified for ONS maintenance inactive leak screening timeliness, specifically regarding the timeliness between the initial leak discovery documented in a work request and the performance of the “inspect, assess, and clean” process in the maintenance procedure which identifies conditions that require a boric acid evaluation. The program procedure specifies a two-week expectation for completion of leak screening and assessment following leak identification. A review of the backlog list indicated that the ONS fluid leak management maintenance team is addressing active leakage cases in a timely manner. However, a backlog primarily consisting of inactive leaks, as indicated by dry white deposits, had developed. This backlog developed due to turnover of personnel. A corrective action was completed to address the backlog and timeliness issue for ONS. Implementation of recommendations identified during the self-assessment resulted in several procedural improvements and clarifications as well as an action completed to implement best practices for maintenance borated water leak screening practices. Overall, the team concluded that the assessed program areas were reflective of good performance.

   OE example 5 provides objective evidence that the *Boric Acid Corrosion* program performs thorough and intrusive program self-assessments to review the compliance and adequacy of programmatic functions and that appropriate actions are taken to improve program performance, when required. This provides reasonable assurance that program effectiveness will be maintained, and aging effects will be managed in the SPEO.

6. In December 2017, a corrective action entry was initiated by operations (found during operator rounds) due to active leakage observed around a Unit 2 high pressure injection pump shaft. The borated water leakage item was documented with pictures and a corrective action was initiated for engineering to perform a boric acid corrosion evaluation.

   In accordance with the *Boric Acid Corrosion* program requirements, engineering performed a boric acid corrosion evaluation on the high-pressure injection pump shaft borated water leakage. The engineering boric acid evaluation included a description of leakage source and leakage path; description and estimated volume of boron deposits (on source and target components); estimated volume and leakage rates; identification of materials affected; and determination of degradation on source and target components. The evaluation determined that no damage, wastage or pitting was occurring on source or targets due to borated water leakage. As a result, it was determined that the borated water leakage did not affect the equipment's ability to perform intended functions. Since there were historical leaks in the fluid leak management database, subsequent quarterly monitoring and inspection requirements were established.

OE example 6 provides objective evidence that the corrective action program is used to document borated water leakage identified during operator rounds. This also demonstrates that boric acid evaluations are performed in accordance with plant and industry guidance. This provides reasonable assurance that the *Boric Acid Corrosion* program will continue to effectively manage aging in the SPEO.

7. In February 2018, maintenance made an entry to the corrective action program to document an active leak identified on a Unit 1 test connection and tubing connection. In accordance with the *Boric Acid Corrosion* Program, engineering performed a borated water leakage evaluation.

   The evaluation included identification of the leakage source and targets, identification of the materials of all affected equipment (both source and targets), description of leakage path including a description of boron deposits on source and target components, including estimated volume and leakage rates, and identification of any degradation of source and target components. Since there was insulation covering some of the target components, it was determined that the insulation would have to be removed to complete the cleaning and final evaluation. Insulation was removed and final cleaning and evaluation was completed. The evaluation determined there were no signs of significant material degradation and potential corrosion rates for current and future expected conditions are negligible. Additional corrective actions included documentation of the leak in the fluid leak management database and generation of a work request to perform repairs. Maintenance tightened the leaking connections and monitored the leak for an additional two months to confirm that the leak was no longer active.

   OE example 7 demonstrates how the ONS *Boric Acid Corrosion* AMP effectively documents plant issues in the corrective action program to establish appropriate actions. The corrective action program was used effectively to identify the cause, evaluate the borated water leakage, and implement appropriate comprehensive corrective actions.

8. In September 2020, an aging management program effectiveness review was performed for the *Boric Acid Corrosion* program. The *Boric Acid Corrosion* program was evaluated against the performance criteria identified in NEI 14-12 “Aging Management Program Effectiveness.” The review concluded that the *Boric Acid Corrosion* program is meeting the requirements of NEI 14-12. No gaps were identified during the effectiveness review.

   OE example 8 provides objective evidence that the current *Boric Acid Corrosion* program is effectively managing aging and meeting all current license renewal commitments. This provides reasonable assurance that ongoing program effectiveness will continue in the subsequent period of operation.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Boric Acid Corrosion* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions requiring additional inspections, re-evaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Boric Acid Corrosion* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Boric Acid Corrosion* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.5 CRACKING OF NICKEL ALLOY COMPONENTS AND LOSS OF MATERIAL DUE TO BORIC ACID INDUCED CORROSION IN REACTOR COOLANT PRESSURE BOUNDARY COMPONENTS

Program Description

The *Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components* AMP is an existing condition monitoring program that manages cracking due to primary water stress corrosion cracking for components or welds constructed from Alloy 600/82/182 and exposed to pressurized water reactor primary coolant at elevated temperatures. Initiation and growth of cracks resulting from primary water stress corrosion cracking can occur as a function of variables which include, but are not limited to, temperature, stress, microstructure, time, and water chemistry. This program is used in conjunction with the *Water Chemistry* (B2.1.2) program.

The *Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components* AMP is based on the EPRI guidance document MRP-126, “Materials Reliability Program: Generic Guidance for Alloy 600 Management.” Bare metal visual, surface, and volumetric examinations are used to detect the presence of primary water stress corrosion cracking. Inspections are performed periodically.

The nickel alloy components that are examined due to susceptibility to primary water stress corrosion cracking include the reactor vessel bottom mounted instrumentation nozzles, small bore hot leg connections and small bore cold leg connections (ASME Code Case N-722, as incorporated by reference in 10 CFR 50.55a).

Nickel alloy components, for which primary water stress corrosion cracking has been mitigated by use of a full structural weld overlay of Alloy 52/152 material, are examined in accordance with ASME Code Case N-770 (Category F), as incorporated by reference in 10 CFR 50.55a. These components include the Unit 1, 2, and 3 pressurizer surge nozzle, hot leg surge nozzle, pressurizer safety relief valve nozzle, pressurizer spray, letdown nozzle and decay heat nozzle. Other susceptible nickel-alloy components that require examination in accordance with ASME Code Case N-770, as incorporated by reference in 10 CFR 50.55a, include unmitigated hot leg components, cold leg components, and core flood nozzle dissimilar weld butt welds.

Other nickel alloy components that are examined, but are resistant to primary water stress corrosion cracking, include the reactor vessel head penetration nozzles and J-groove welds (ASME Code Case N-729, as incorporated by reference in 10 CFR 50.55a). Inspections are also performed for Alloy 600 full penetration branch connection weld metal buildup for material susceptible to primary water stress corrosion cracking in accordance with ASME Code Case N-853.

The *Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components* AMP inspects components that are susceptible to corrosion due to borated water leakage from nearby or adjacent nickel alloy components previously described. Findings of borated water leakage or boric acid on Alloy 600/ 82/182 components are documented in accordance with the *Boric Acid Corrosion* program. The *Water Chemistry* program monitors and controls water environments consistent with industry guidelines to ensure that the reactor coolant water environments are favorable to mitigate primary water stress corrosion cracking in nickel alloy components.

NUREG-2191 Consistency

The *Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components* AMP is an existing program that is consistent with NUREG-2191, Section XI.M11B, *Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components*.

Exceptions to NUREG 2191

None.

Enhancements

None.

Operating Experience

Based on a broad search of pertinent ONS OE, the following examples provide objective evidence that the *Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In 2003 and 2004, the ONS (Unit 1, 2 and 3) original reactor vessel heads were replaced with heads containing Alloy 690 materials that are resistant to primary water stress corrosion cracking (PWSCC) where Alloy 600 was used previously.

   The ONS Unit 1 replacement reactor vessel head containing PWSCC-resistant materials was installed in September 2003 at which time a pre-service inspection was performed. The first bare metal visual augmented inservice inspection on the replacement reactor pressure vessel head was performed in April 2008. A volumetric exam was also performed on the ONS Unit 1 reactor vessel head in the Fall of 2012. Additional reactor pressure vessel head surface bare metal visual inspections (Code Case N-729) were performed in November 2012, November 2016, and November 2020. No signs of degradation or penetration leakage were identified.

   The ONS Unit 2 replacement reactor vessel head containing PWSCC-resistant materials was installed in March 2004 at which time a pre-service inspection was performed. The first bare metal visual augmented inservice inspection on the replacement reactor pressure vessel head was performed in November 2008. A volumetric exam was performed on the ONS Unit 2 reactor vessel head in the Fall of 2013. Additional reactor pressure vessel head surface bare metal visual inspections (Code Case N-729) were performed in November 2011, October 2015, and October 2019. No signs of degradation or penetration leakage were identified.

The ONS Unit 3 replacement reactor vessel head containing PWSCC-resistant materials was installed in April 2003 at which time a pre-service inspection was performed. The first bare metal visual augmented inservice inspection on the replacement reactor pressure vessel head was performed in November 2007. A volumetric exam was also performed on the ONS Unit 3 reactor vessel head in the Spring of 2012. Additional reactor pressure vessel head surface bare metal visual inspections (Code Case N-729) were performed in May 2012, April 2016, and April 2020. No signs of degradation or penetration leakage were identified.

OE example 1 demonstrates that the existing program is performing mitigation through component replacement as well as performing inspections in accordance with regulatory and ASME Code requirements.

2. In January 2005, an entry was made in the corrective action program to determine required actions to comply with industry guidance contained in EPRI MRP-126, *Generic Guidance for Alloy 600 Management*. MRP-126 provides guidance for plants to use in developing their individual Alloy 600 management plans including key elements and useful resources for developing and implementing a plant-specific plan. As a result of this corrective action item, ONS updated the Alloy 600 program to add detail on how each of the ten AMP elements are being met. The Alloy 600 program plan included a combination of potential mitigation options such as replacement, full structural overlay, or mechanical stress improvement. ONS documented mitigation strategies planned to maintain the function of each Alloy 600/82/182 component for the remaining life of the plant. ONS mitigation activities were specifically selected based on the individual requirements of each location. In addition, a list of Alloy 600 degradation experience for the industry was compiled and included in the ONS Alloy 600 engineering support document.

   OE example 2 provides objective evidence that industry OE reviews are documented in the corrective action program to evaluate and make necessary program enhancements, as necessary. This example also demonstrates that OE is used as a primary feedback mechanism for the Alloy 600 program which will ensure ongoing program effectiveness.

3. In 2009 and 2010, baseline ASME code case visual inspections were completed for the Unit 1, Unit 2, and Unit 3 lower head bottom mounted instrumentation nozzles without any adverse findings or degradation identified. The most recent lower reactor vessel head bottom mounted instrumentation nozzle visual examinations were performed in the Fall of 2018 for Unit 1, Fall of 2017 for Unit 2, and Spring of 2020 for Unit 3. All exams were acceptable and found no indications of age related degradation.

   OE example 3 provides objective evidence that required reactor vessel lower head inspections are being performed in accordance with 10 CFR 50.55a using the methods recommended to identify aging effects. Future inspections are scheduled, as required, to ensure aging effects are identified prior to loss of intended function.

4. In June 2011, a corrective action program entry was made to evaluate the revision to 10 CFR 50.55a and initiate corrective actions, as necessary, to ensure timely implementation. The NRC also incorporated by reference (with conditions on their use) ASME Boiler and Pressure Vessel Code Case N-722-1, *Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated with Alloy 600/82/182 Materials*, and ASME Boiler and Pressure Vessel Code Case N-770-1, *Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated With UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities*. Corrective actions documented evaluations of ASME Code Cases N-722, N-770, and the conditions published in the NRC final rulemaking.

   ONS specific actions included performing an evaluation of the impact of the changes to 10 CFR 50.55a related to implementation of Code Cases N-722-1 and N-770-1. Corrective actions completed included revising program documents to comply with conditions imposed on inspection program requirements. This corrective action also evaluated and completed the necessary actions to transition from MRP-139, Revision 1 to ASME Code Case N-770-1 with conditions imposed under 10 CFR 50.55a. The ONS augmented inservice inspection plan was updated with the new requirements and details related to applicable ASME Code Case compliance.

   OE example 4 provides objective evidence that the corrective action program is effectively used to evaluate and complete required actions to respond and comply with updated industry and regulatory requirements in a timely manner.

5. In May 2012, a corrective action entry was initiated in the corrective action program to evaluate industry OE contained in EPRI letters NDE 2012-02 and 2012-03. The EPRI letters were written to address an ultrasonic examination that did not detect the presence of axial indications that were later discovered during machining of a pressurized water reactor component. The major contributor was determined to be a weakness in the plant-specific non-destructive examination program which did not provide adequate oversight of technicians performing the inspections. Applicable ONS non-destructive examination processes and procedures were reviewed, including prerequisites for critical high profile examinations. Program enhancements were made to the following: procedures, training, personnel qualifications, prejob briefing information, component configuration verification, inspection mockup requirements, calibration techniques, required equipment validation to meet inspection requirements, and inspection results data review requirements. In addition, multiple non-destructive examination Level III reviews of EPRI Technical Report 1018181, *EPRI Guidelines for conducting Ultrasonic Examinations of Dissimilar Metal Welds* were performed to verify all associated ONS non-destructive examination guidance is aligned with this industry guidance. Other actions included adding this industry OE to future examination prejob briefings as well as applicable training materials.

   OE example 5 demonstrates the effective use of industry OE and the corrective action program to identify programmatic gaps, perform extent of condition reviews, and take timely corrective action to ensure aging effects are identified and component intended functions are maintained during the PEO.

6. In July 2012, a self-assessment was performed to review the status of LR commitment completion and readiness for the License Renewal IP-71003 NRC Phase 2 inspection. Reviews were conducted to verify open commitments were completed and previously closed commitments had not been adversely impacted by changes to the facility, programs or documents. The assessment team concluded that the Alloy 600 AMP adequately documented and completed required LR commitments. No performance deficiencies or gaps were identified. A strength was noted for program owner knowledge and consistently incorporating industry OE related to managing aging to enhance the program effectiveness.

   OE example 6 provides objective evidence that self assessments of LR activities and programs, including Alloy 600, are periodically performed to review and self-identify any required actions that are needed for continuous improvement.

7. In August 2012, the NRC performed an inspection in accordance with inspection procedure, IP-71003, and the results were documented in the corrective action program. One of the commitment items selected for inspection sample included the Alloy 600 AMP. The NRC noted the following in their inspection report:

   - This Commitment specified that prior to the PEO, ONS would implement an Alloy 600 AMP to manage cracking due to primary water stress corrosion cracking of Alloy 600 and Alloy 82/182 locations, including the Alloy 82/182 cladding in the hot leg flowmeter element. The ONS LR application identified primary water stress corrosion cracking as the applicable aging effect for reactor coolant system Alloy 600 components and Alloy 82/182 weld metal. The original Alloy 600 program, described in the LR application, relies on engineering evaluations to predict the most susceptible components, coupled with periodic volumetric nondestructive examinations to confirm the predictions. Duke Energy committed to completing inspections of the five most susceptible locations prior to ONS Unit 1 PEO (February 6, 2013). Subsequent to the issuance of the ONS renewed operating license, in September 2008, 10 CFR 50.55a mandated long term inspection requirements specified in the ASME B&PV Code Case N-722. The NRC issued Bulletin 2004-1 and endorsed EPRI's Materials Reliability Program 139 report. These documents provided guidance for the mitigation or inspection of Alloy 82/182 butt welds in reactor coolant system piping greater than four inches in diameter.
   - ONS updated the Alloy 600 Program to incorporate these additional requirements and MRP-139 guidelines. The current ONS Alloy 600 Program includes preemptive measures to replace Alloy 600 components with Alloy 690 or stainless steel components and apply full structural weld overlays over Alloy 82/182 welds using alloy 52/152 weld metal, based on service temperature. The Program also included periodic visual and volumetric examinations to detect cracking of Alloy 600/82/182 components and welds. The inspectors reviewed the licensing basis, program basis documents, implementing procedures, corrective actions, the UFSAR, inspection records; and interviewed the responsible plant personnel regarding these documents. The inspectors determined that the implementation of the current Alloy 600 Program activities provides reasonable assurance that ONS will effectively manage Alloy 600/

82/182 aging of reactor coolant system components and welds susceptible to primary water stress corrosion cracking during the PEO.

OE example 7 provides objective evidence that first LR program commitments have been properly implemented. This also demonstrates that the current Alloy 600 AMP continues to maintain program effectiveness by meeting all regulatory and industry requirements which include periodic visual and volumetric examinations to detect cracking of Alloy 600/ 82/182 components and welds. Continued implementation of the ONS Alloy 600 inspection activities provides reasonable assurance that ONS will effectively manage the aging effects in susceptible nickel alloy components prior to loss of intended function during the SPEO.

8. In December 2014, a corrective action item was initiated to track the development and communication of a comprehensive fleet Alloy 600 plan for management of remaining Alloy 600 locations by mitigation or examination. Corrective actions included the fleet Alloy 600 engineering program lead working with all Duke Energy sites to identify which Alloy 600 locations require mitigation and selection of an optimal mitigation method for those locations, determination of which locations can be adequately managed through continued examination, and documentation of the technical basis for these decisions. As part of these actions, a review of compliance with MRP-126 was performed. Site specific recommendations were documented and presented to senior management at each site. All actions were assigned and completed as a result of this corrective action entry which resulted in several Alloy 600 programmatic enhancements at each site.

ONS specific activities included development of a comprehensive Alloy 600 plan for management of remaining Alloy 600 locations by mitigation or examination. This plan included identifying which Alloy 600 locations require mitigation, selection of an optimal mitigation method for those locations, determination of which locations can be adequately managed through continued examination, and documentation of the technical basis for these decisions. ONS developed a detailed listing of Alloy 600 component examinations with the Alloy 600 pressure boundary components and locations, unique weld numbers for each location, where applicable, and the operating temperature of each component or location. The Oconee Alloy 600 program implements a long range strategy that includes continual inspection, mitigation, or replacement for specific Alloy 600 locations not previously mitigated. This Alloy 600 program plan information is considered a living plan that is modified, as needed, to account for changes in strategy, mitigation and inspection technology, or OE to ensure program effectiveness is maintained and industry and regulatory requirements are met.

OE example 8 provides objective evidence that the AMP manager critically self assesses Alloy 600 program performance and self identifies actions that support continuous improvement to ensure ongoing program effectiveness.

9. In October 2016, an Alloy 600 program self-assessment was performed to review programmatic, industry, and regulatory compliance. No gaps or areas for improvement were noted. Recommendations were identified which led to enhancing program guidance to ensure the Alloy 600 program continues to meet the intent of MRP-126 as an NEI 03-08 mandatory initiative, aligns with requirements of 10 CFR 50.55a, and has clear

programmatic responsibilities defined. Other enhancements included improvements to ensure ongoing health and performance of the Alloy 600 program.

OE example 9 demonstrates that the initial LR Alloy 600 aging management activity is being effectively managed during the PEO. Programmatic controls to perform periodic program self-assessments are currently in place to ensure the AMP will continue to enhance the program to further improve the effectiveness of the program during the initial PEO and SPEO.

10. In January 2019, an entry into the corrective action program was made to review NRC Regulatory Issue Summary 2018-06, Clarification of the Requirements for Reactor Pressure Vessel Upper Head Bare Metal Visual Examinations. The NRC issued this regulatory issue summary to clarify the requirements for bare-metal visual examination to meet the requirements of Notes 1 and 4 in Table 1 of ASME Code Case N-729-4, "*Alternative Examination Requirements for PWR Reactor Vessel Upper Heads with Nozzles Having Pressure-Retaining Partial-Penetration Welds Section XI, Division 1*." As identified in the regulatory issue summary, two recent industry events illustrate how the requirements of Code Case N-729-4 can be misinterpreted by licensees. Although these events did not occur at ONS, this industry OE is directly applicable to ONS activities where visual inspection of the reactor vessel closure head is performed to identify evidence of pressure boundary leakage and, as such, this item was evaluated for applicability to the Duke Energy fleet, including ONS.

    As a result of this OE, fleet procedures for performing the bare metal visual examinations were reviewed to ensure relevant conditions are clearly defined to ensure compliance with ASME Code Case N-729-4, Subsection 3142.1(b). These procedural requirements were reviewed to ensure examination of the as-found condition is performed prior to any removal or cleaning of boron deposits and clear steps are described to address how to proceed with the as found condition of reactor vessel heads. Procedural guidance was verified to state that relevant conditions include very small boron deposits or dusting of boron.

    OE example 10 provides objective evidence that regulatory issues and industry OE are entered into the corrective action program and evaluated to ensure appropriate actions are taken to evaluate and modify the program, as required, to ensure ongoing compliance with regulatory requirements.

11. In July 2020, an AMP effectiveness review was performed for the ISI program which included a review of Alloy 600 program inspection activities. The Oconee ISI aging management activities were evaluated against the performance criteria identified in NEI 14-12, "*Aging Management Program Effectiveness*". The ISI AMP effectiveness review included a review of the most recent augmented inspection activities performed for nickel alloy components and welds. No gaps were identified by this effectiveness review and no degradation was identified for any of the nickel alloy augmented inspections performed.

    OE example 11 provides objective evidence that the current ONS Alloy 600 Program is effectively managing aging and meeting all current LR commitments. This provides reasonable assurance that ongoing program effectiveness will continue in the SPEO.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.6 THERMAL AGING EMBRITTLEMENT OF CAST AUSTENITIC STAINLESS STEEL (CASS)

Program Description

The *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* aging management program is a new condition monitoring program that provides reasonable assurance that specific reactor coolant pressure boundary CASS components susceptible to thermal aging embrittlement will continue to perform their intended function consistent with the current licensing basis during the SPEO. The specific reactor coolant system (Class 1) pressure boundary components consist of those made from CASS with service conditions above 250°C (482°F), including valve bodies and pump casings and covers. Oconee does not have Class 1 piping or fittings fabricated from CASS. Additionally, reactor vessel internal components fabricated from CASS are not within the scope of this aging management program and are managed by the *PWR Vessel Internals* (B2.1.7) aging management program.

For Class 1 CASS valve bodies with service conditions above 250°C (482°F), a screening for significance of thermal aging embrittlement is not required based on the results of the assessment documented in the letter dated May 19, 2000, from Christopher Grimes, NRC, to Douglas Walters, NEI (ADAMS Accession Number ML15223A635). The existing ASME Code, Section XI inspection requirements are adequate to manage thermal aging embrittlement for these valve bodies. The Section XI inspection requirements are implemented at Oconee through the Oconee *ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD* (B2.1.1) AMP.

For Class 1 CASS reactor coolant pump casings and covers with service conditions above 250°C (482°F), a screening for significance is performed as a first step to determine if thermal aging embrittlement is a potentially significant aging effect. This screening considers casting method, molybdenum content, and percent ferrite in each casting. For Class 1 CASS reactor coolant pump casings and covers that screen out, thermal aging embrittlement is considered not to be a potentially significant aging effect, and no additional actions are required under this program.

For Class 1 CASS reactor coolant pump casings and covers that screen in, thermal aging is considered to be potentially significant. Consequently, those materials are susceptible to thermal aging embrittlement. This screening was completed for the various reactor coolant pump casing and covers. Results of this screening identified four reactor coolant pump material heats that are susceptible to thermal aging embrittlement. As a second step, Oconee applied the alternative described in NUREG-2191 and addressed the flaw tolerance of the four reactor coolant pump material heats that were identified by screening to be susceptible. Specifically, the original flaw tolerance evaluation performed as a part of ASME Code Case N-481 was updated for subsequent license renewal. A bounding flaw tolerance evaluation for these four heats of materials was performed. The result successfully demonstrated that thermal aging embrittlement of these four heats of material have adequate fracture toughness to address thermal aging embrittlement for the SPEO. The successful result also means that no additional inspections or evaluations are required to address thermal aging embrittlement for the SPEO.

NUREG-2191 Consistency

The *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* is a new program that will be consistent with the ten elements of AMP XI.M12, *“Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)”* specified in NUREG-2191 (GALL- SLR), as modified by SLR-ISG-2021-02-MECHANICAL, *“Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance, Interim Staff Guidance.”*

Exception to NUREG-2191

None

Enhancements

None

Operating Experience

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* AMP will be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO.

1. OE related to effective program implementation is available in the discussion of the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* AMP.

   OE example 1 provided objective evidence that the process of performing assessments is effective at identifying areas for improvement and that recommendations are appropriately implemented into the program. This will ensure that the implementation of the *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* AMP, including performing program assessments will ensure that *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* program will be implemented in accordance with program requirements during the SPEO.

2. Unit 2 Decay Heat suction line valve 3LP-2, manufactured from A351-CF8M, was inspected during refueling outage O3R26 (Spring 2012) when the valve was disassembled for maintenance. No recordable indications were identified. Unit 1 Core Flood valve 1CF-14, manufactured from A-351-CF8M, was inspected during refueling outage O1R28 (Fall 2014) when the valve was disassembled for maintenance. No recordable indications were identified.

   OE example 2 provides objective evidence that the ASME Section XI Inservice Inspection (ISI) program is effectively utilized to perform required examinations of cast austenitic stainless steel valve bodies that are within the scope of the *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* program.

A search of industry operating experience was performed, and no industry operating experience specific to thermal aging embrittlement in CASS components was identified.

The above examples of OE provide objective evidence that the aging management activities and methods to be implemented by the *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the current licensing basis during the SPEO.

B2.1.7 PWR VESSEL INTERNALS

Program Description

The *PWR Vessel Internals* AMP is an existing condition monitoring program that manages change in dimensions due to void swelling, cracking, reduction of fracture toughness, loss of material, and loss of preload for the reactor vessel internals. The aging effect of cracking includes stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking, and cracking due to fatigue/cyclic loading. Degradation due to loss of material can be induced by wear, and reduction of fracture toughness is the result of thermal aging embrittlement and neutron irradiation embrittlement. Potential causes for the aging effect of changes in dimensions are void swelling or distortion, and loss of preload can result from thermal and irradiation-enhanced stress relaxation and irradiation-enhanced creep.

The *PWR Vessel Internals* AMP relies on implementation of the inspection and evaluation guidelines in MRP-227-A. The MRP-227-A documents requirements imposed by the industry under NEI 03-08, to manage reactor vessel internals aging. The ONS reactor vessel internals inspection plan was approved by the NRC in an SER dated June 19, 2015 and is described in the Oconee UFSAR, Revision 28, Section 18.3.20. The ONS reactor vessel internals inspection plan is not affected by the ONS measurement uncertainty recapture power increase.

In accordance with NUREG-2191, AMP XI.M16A, a gap analysis is to be performed for SLRA with a focus on the component items and/or welds whose screening and/or severity of age-related degradation mechanisms changes for 60-80 years. The gap analysis is required to be based on MRP-227-A; however, since the release of MRP-227-A, the industry has prepared a revision to MRP-227 (MRP-227 Revision 1-A) and the NRC has reviewed this revision and provided its approval. The NRC SER contained in MRP-227, Revision 1-A states: *"The NRC staff finds MRP-227, Revision 1, as modified by this SE and subject to the Applicant/Licensee Action Item detailed in Section 4.0 of this SE, provides an acceptable baseline or starting point for an AMP for SLR subject to a gap analysis as described in the SRP-SLR Section 3.1.2.2.9 and GALL-SLR, AMP XI.M16A. An exception to GALL-SLR AMP XI.16A must be identified in such cases."*

The NRC has developed interim staff guidance (ISG), which updates the GALL-SLR report and standard review plan (SRP)-SLR to reflect the revised inspection and evaluation (I&E) guidelines of MRP-227, Revision 1-A. Therefore, it is appropriate to prepare the ONS gap analysis using MRP-227, Revision 1-A.

In accordance with MRP-227, Revision 1-A, the selection of reactor vessel internals items to be inspected is based on a four-step ranking process that includes the designations of *"Primary"*, *"Expansion"*, and *"Existing Programs"* (such as ASME Code, Section XI, Examination Category B-N-3 examinations of core support structures), and *"no additional measures"*. The program includes expanding examinations (i.e., *"Expansion"* components) if the observed extent of degradation for the *"Primary"* items exceeds acceptance criteria. The identified examinations for reactor vessel internals items provide reasonable assurance that the effects of age-related degradation mechanisms will be managed during the SPEO.

Gap Analysis Results

For the 80-year operating period (72 EFPY for Oconee), a gap analysis was completed that incorporates screening, categorizing, and ranking results from MRP-189, Revision 3 and engineering evaluation and assessment of age-related degradation from MRP-229 to identify revisions and/or additional inspections not listed in MRP-227, Revision 1-A. The Oconee gap analysis methodology is similar to the Westinghouse gap analysis methodology, which integrates the interim guidance from MRP 2018-022 to identify additional inspections not listed in MRP-227, Revision 1-A.

Revisions to MRP-227, Revision 1-A, for SLR Based on Time-Dependent Age-Related Degradation Mechanisms

The ONS gap analysis relies on MRP-189, Revision 3, which reports screening, categorization, and ranking of PWR internals items and welds for susceptibility and significance to time-dependent age-related degradation mechanisms for SLR for B&W designed PWRs using the screening criteria developed in Appendices A-H of MRP-175, Revision 1. Time-dependent age-related degradation mechanisms applicable to reactor vessel internals items that must be considered for SLR include irradiation-assisted stress corrosion cracking, metal fatigue, thermal aging embrittlement, irradiation embrittlement, void swelling, and irradiation-enhanced stress relaxation and irradiation-enhanced creep.

Screening criteria that require neutron exposure as an input were developed in MRP-175, Revision 1, based on a review of test data and construction of lower bound curves (e.g., Figure B-6, Plot of stress vs. neutron exposure to be used as screening criteria for irradiation-assisted stress corrosion cracking). This non-statistical bounding approach does not provide guidance for determination of uncertainty in the neutron exposure used as an input to the screening criteria. Therefore, a reasonable approach for SLR relative to the damage correlations reported in MRP-175, Revision 1, is to utilize best estimate neutron exposure at 72 EFPY as reported in MRP-189, Revision 3, which is consistent with the treatment of neutron exposure for 60-years reported in MRP-227, Revision 1-A.

Reactor Vessel Internals Neutron Exposure (displacements per atom) at 72 EFPY

As discussed in MRP-189, Revision 3, Sections 3.2, Item C and 3.3, Item B, neutron exposures are best-estimate values in units of displacements per atom at the end of 80 calendar years of operation, which are projected from existing 60-year documentation. In most instances, displacements per atom values reported in MRP-189, Revision 3, are obtained from a conservative extrapolation of discrete ordinate transport 60-year best estimate analyses to 80-years to bound the B&W fleet. The 60-year discrete ordinate transport displacements per atom values were obtained using methods that comply with Regulatory Guide 1.190 for the reactor vessel as reported in BAW-2241NP-A, Revision 2.

To support SLR, Duke Energy completed 72 EFPY Oconee-specific neutron exposure (displacements per atom) calculations for the ONS reactor vessel internals using both 2-D discrete ordinate transport methods and 3-D Monte Carlo N-Particle method. While the discrete ordinate transport methodology is compliant with RG 1.190 for the reactor pressure vessel (RPV), it is recognized that there are regions internal to the RPV where the discrete ordinate transport model may not give results of sufficient accuracy, so the Monte Carlo N-Particle method was also used for comparison. For conservatism, a 1.64% (2% assumed for conservatism) measurement uncertainty recapture power uprate was assumed.

These 72 EFPY best estimate evaluations (i.e., maximum of discrete ordinate transport and Monte Carlo N-Particle for each reactor internals component item and weld) were compared to the inputs reported in MRP-189, Revision 3. All MRP-189, Revision 3 values were found to be appropriate after comparison to the 72 EFPY ONS-specific displacements per atom values for the reactor vessel internals base metal and weld metal items.

Reactor Vessel Internals Metal Fatigue at 80-Years

As discussed in Section 4.5.1 of BAW-2248A, the ONS reactor vessel internals were designed and constructed prior to the development of ASME Code requirements for core support structures. As such, fatigue cumulative usage factors were not calculated during original construction and are only available for a select number of replacement bolting items; therefore, cumulative usage factor values were not available, with the exception of replacement bolting, for fatigue screening using the MRP-175, Revision 1 screening criterion for fatigue. This screening criterion is based on cumulative usage factor value.

As described in MRP-189, Revision 3, Section 3.2, Item H and Section 3.3, Item F, in order to support fatigue screening for SLR, an Oconee-specific finite element model of the reactor vessel internals was created. The finite element model was utilized to develop a ranking of the reactor vessel internals items with respect to susceptibility to fatigue by using stresses of the modeled component items and welds considering dead weight with and without fuel, preload, thermal transients, gamma heating, hydraulic loads, and loads associated with core clamping (including reactor vessel ledge radial motions). This evaluation only considered reactor vessel internals items and welds critical for core support, safe shutdown, or maintaining a coolable geometry. Items that do not affect any of these three functions were only included if their presence affects the loading on a critical item or weld. In addition, reactor vessel internals items that were screened in for fatigue in the previous revision, MRP-189, Revision 2 for 60-years, (e.g., the baffle-to-former bolts) remain screened in for SLR, and were not modeled in detail for the fatigue ranking analysis.

Of the component items considered in this fatigue ranking evaluation, the core barrel cylinder was found to be the most potentially susceptible. A fatigue calculation of the ONS core barrel cylinder confirmed that the cumulative usage factor value for the core barrel cylinder is less than one (1). Therefore, the fatigue age-related degradation mechanism does not screen in for the ONS component items considered in the fatigue ranking evaluation.

Applicability of MRP-227, Revision 1-A to ONS

As noted in the NRC safety evaluation to MRP-227, Revision 1-A, Section 3.6.1, confirmation of four items contained in Section 2.4 of MRP-227, Revision 1-A, Applicant/

Licensee Action Item 1, *"Applicability of FMECA and Functionality Analysis Assumptions,"* is required for 60-years. Compliance with these requirements was demonstrated for 60-years relative to MRP-227, Revision 1-A and, at present, will not change for the SPEO.

1. 30 years of operation with high-leakage core loading patterns (fresh fuel assemblies loaded in peripheral locations) followed by implementation of a low-leakage fuel management strategy for the remaining 30 years of operation, as well as the average core power levels and proximity of active fuel to the upper core support plate satisfies limits as described in Appendix B for Westinghouse/Combustion Engineering plants;

2. The power plant has operated for the majority of its lifetime as a base-loaded unit and is currently operating as a base-loaded power plant, in that the unit operates at fixed thermal power levels and does not usually vary power on a calendar or load demand schedule;

3. No design changes beyond those identified in general industry guidance or recommended by the original vendors; and

4. The components and material class of each functional component are as listed in the latest revision of MRP-189 or MRP-191, as applicable to the individual plant design

The following listing identifies the changes that are included in the *PWR Vessel Internals* AMP for SLR based on the Oconee gap analysis, which considered time-dependent damage mechanisms discussed above. The changes SLR for Oconee are made relative to MRP-227, Revision 1-A, Table 4-1 (*Primary*), Table 4-4 (*Expansion*), and Table 5-1 (*Examination Acceptance* and *Expansion Criteria*); all remaining entries in MRP-227, Revision 1-A, Table 4-1, Table 4-4, and Table 5-1 are not revised. Note there are no *Existing Programs* for the B&W units in MRP-227, Revision 1-A or for Oconee.

Revisions to MRP-227, Revision 1-A, Table 4-1, B&W Plants Primary, for the ONS Units

The following listing identifies the changes that are included in the *PWR Vessel Internals* AMP:

- General: removed visual VT-3 examination of high-strength bolt locking devices.

- Examination method/frequency for the plenum cover assembly and core support shield assembly (Item B1) was updated. The initial one-time physical measurement required by the MRP-227 guideline is complete for all Oconee units; no relevant indications have been observed. Subsequent visual (VT-3) examination are to be performed during each 10-year ISI interval.

- Examination coverage for the plenum cover assembly and core support shield assembly (Item B1) was updated. Accessible top surfaces of the plenum cover support ring/plenum cover weldment rib pads and CSS top flange when the RV closure head and plenum assembly were removed as areas for examination.

- The expansion link to vent valve bodies for the control rod guide tube assembly, control rod guide tube spacer castings (Item B2) was removed. It has been determined that the vent valve bodies are not susceptible to thermal aging embrittlement (see MRP-189, Revision 3, Section 3.2, Item J.2). There is no expansion link for the control rod guide tube assembly, control rod guide tube spacer castings (Item B2).

- New age-related degradation mechanisms were added for the core support shield assembly, upper core barrel bolts (Item B7). The new age-related degradation mechanisms are irradiation-enhanced stress relaxation and irradiation-enhanced creep, fatigue, and wear.

- An expansion link note was added for the core support shield assembly, upper core barrel bolts (Item B7). The note states that the primary-expansion relationship between the upper core barrel, lower core barrel, and flow-distributor bolts and the upper thermal shield and lower thermal shield bolts/studs is for stress corrosion cracking only.

- A new expansion link note was added for the core barrel assembly, lower core barrel bolts (Item B8). The note states that the primary-expansion relationship between the upper core barrel, lower core barrel, and flow distributor bolts and the upper thermal shield and lower thermal shield bolts/studs is for stress corrosion cracking only.

- A new age-related mechanism was added for the core barrel assembly, baffle-to-former bolts (Item B9). The new age-related degradation mechanism is void swelling.

- An expansion link note was added for the core barrel assembly, baffle-to-former bolts (Item B9). The note states that the core barrel-to-former bolts are Category A for void swelling, so expansion does not apply.

- A new age-related degradation mechanism was added for the core barrel assembly, baffle plates (Item B10). The new age-related degradation mechanism is void swelling.

- Expansion links for the core barrel assembly, baffle plates (Item B10) were revised. core barrel cylinder (including vertical and circumferential seam welds) and lower grid rib section were removed as expansion links. Former plates were retained as an expansion link.

- An expansion link note was added for the flow distributor assembly, flow distributor bolts (Item B12). The note states the Primary-Expansion relationship between the upper core barrel, lower core barrel, and flow distributor bolts and the upper thermal shield and lower thermal shield bolts/studs/nuts is for stress corrosion cracking only.

- An age-related degradation mechanism was removed for the incore monitoring instrumentation guide tube assembly, incore monitoring instrumentation guide tube spiders, incore monitoring instrumentation guide tube spider-to-lower grid rib section welds (Item B15). Thermal aging embrittlement was removed as an applicable degradation mechanism for the incore monitoring instrumentation spiders as ferrite screening has determined that these items are not susceptible to thermal aging embrittlement.

- A new expansion link for the incore monitoring instrumentation guide tube assembly, incore monitoring instrumentation guide tube spiders, incore monitoring instrumentation guide tube spider-to-lower grid rib section welds (Item B15) was added. The new expansion link is upper grid fuel assembly support pad items: pad, Alloy X-750 dowel, cap screws, and their locking welds (Item B15.2).

- Examination coverage for the incore monitoring instrumentation guide tube assembly, incore monitoring instrumentation guide tube spiders, incore monitoring instrumentation guide tube spider-to-lower grid rib section welds (Item B15) was clarified. Clarification of the meaning of adjacent was provided along with a corresponding note.

- New Primary Items were added:

    - Core barrel assembly: core barrel cylinder top flange circumferential weld heat affected zone (Unit 2 only) (Item B16)
    - Core barrel assembly: core barrel cylinder center circumferential weld regions (Unit 2 only) (Item B17)
    - Lower grid rib assembly: lower grid rib section (Item B18)

The new Primary Items have the following Attributes:

Table B2.1.7-1: MRP-227-1-A Table 4-1, B&W Plants Primary Items

Primary Component Item	Applicability	Effect (Mechanism)	Expansion Link	Examination Method/ Frequency	Examination Coverage
B16.Core Barrel Assembly Core Barrel cylinder top flange circumferential weld HAZ	ONS Unit 2	Cracking (SCC, IE), including the detection of surface-breaking crack-like indications	None	Enhanced visual (EVT-1) examination, ultrasonic (UT) examination, or eddy current (ECT) examination no later than two refueling outages from the beginning of the LR period. Subsequent examination during each 10- year ISI interval Alternately, in lieu of examination, this item can be addressed by evaluation that is submitted for NRC Staff approval.	100% of the accessible OD surfaces of ¾" of the adjacent base metal to the core barrel cylinder top flange weld.
B17.Core Barrel Assembly Core barrel cylinder center circumferential weld region	ONS Unit 2	Cracking (IASCC, IE), including the detection of surface-breaking crack-like indications and/or readily detectable cracking.	None	Enhanced visual (EVT-1) examination, ultrasonic (UT) examination, or eddy current (ECT) examination no later than two refueling outages from the beginning of the license renewal period. Subsequent examination during each 10- year ISI interval. Alternately, in lieu of examination, this item can be addressed by evaluation that is submitted for NRC Staff approval.	100% of the accessible weld length of the OD of the center circumferential weld and ¾" of the adjacent base metal.
B18.Lower Grid Assembly Lower grid rib section	ONS Unit 1 ONS Unit 2 ONS Unit 3	Cracking (IE), including the detection of readily detectable cracking	None	Visual (VT-3) examination no later than two refueling outages from the beginning of the LR period. Subsequent examination during each 10- year ISI interval.	100% of accessible surfaces of ¼" of the adjacent base metal of the lower grid rib section to the spider-to-lower grid rib section welds

Revisions to MRP-227, Revision 1-A, Table 4-4, B&W Plants Expansion, for the ONS Units

The following listing identifies the changes that are included in the ONS *PWR Vessel Internals* AMP:

- General: Removed visual VT-3 examination of high-strength bolt locking devices.
- Vent valve assembly, vent valve bodies (Item B2.1) was removed as an expansion Item as it has been determined that these component items are not susceptible to thermal aging embrittlement (see MRP-189, Revision 3, Section 3.2, Item J.2).
- A new age-related degradation mechanism for the core barrel assembly, baffle-to-baffle bolts (Item B9.1) was added. The new age-related degradation mechanism is void swelling.
- A new age-related degradation mechanism for the core barrel assembly, former plates (Item B10.2) was added. The new age-related degradation mechanism is void swelling.
- Core barrel cylinder (including vertical and center circumferential seam welds) (Item B10.1) was reclassified as “No additional Measures” for ONS Unit 1 and ONS Unit 3. The vertical seam welds were also reclassified as “No Additional Measures” for ONS Unit 2. The top flange circumferential weld heat affected zone and center circumferential weld region were reclassified as Primary Items for ONS Unit 2 only.
- Lower grid rib section (Item B10.3) was reclassified as a primary item.
- Examination method/frequency for the lower grid assembly, lower thermal shield studs (Item B8.1) was updated. The updated examination method is a new visual (VT-3) examination of the lower thermal shield nuts.
- New expansion items were added based on a revision to primary item incore monitoring instrumentation guide tube spiders and spider-to-lower grid rib section welds (Item B15).

The new expansion items have the following attributes:

Table B2.1.7-2: MRP-227-1-A Table 4-4, B&W Plants Expansion Items

Expansion Component Item	Applicability	Effect (Mechanism)	Primary Link	Examination Method/ Frequency	Examination Coverage
Upper Grid Assembly B15.2.Upper grid fuel assembly support pad component items: pad, Alloy X-750 dowel, cap screws, and their locking welds	ONS Unit 1 ONS Unit 2 ONS Unit 3	Cracking (IE), including the detection of separated or missing welds, missing support pads, dowels, cap screws and locking welds, or misalignment of the support pads	B15.a. incore monitoring instrumentation guide tube spiders and B15.b. incore monitoring instrumentation guide tube spider-to-lower grid rib section welds	Visual (VT-3) examination. Subsequent examination during each 10-year ISI interval unless an applicant/ licensee provides an evaluation for NRC Staff approval that justifies a longer interval between inspections	Accessible surfaces of the pads, dowels, cap screws, and associated welds for 100% of the upper grid fuel assembly support pads.

Revisions to MRP-227, Revision 1-A, Table 4-7, B&W Plants Existing Programs

For 60-years, no existing generic industry programs were considered sufficiently specific for monitoring the aging effects addressed by MRP-227, Revision 1-A, for B&W plants. Therefore, no reactor vessel internals items for B&W plants were placed into the existing programs group, and there is no Table 4-7. This conclusion has not changed for SLR.

Revisions to MRP-227, Revision 1-A, Table 5-1, B&W Plants Acceptance and Expansion Criteria

The following listing identifies the changes that are included in the *PWR Vessel Internals* AMP:

- General: removed references to visual VT-3 examination of high-strength bolt locking devices.
- The expansion link to vent valve bodies for the control rod guide tube assembly spacer castings (Item B2) was removed.
- Expansion criteria wording for the core barrel assembly, upper core barrel bolts (Item B7) was updated to include expansion to 100% of the lower thermal shield nuts.
- Expansion Criteria wording for the core barrel assembly, lower core barrel bolts (Item B8) was updated to include expansion to 100% of the lower thermal shield nuts.
- Expansion links to the core barrel cylinder (including vertical and center circumferential seam welds) (Item B10.1) and lower grid rib section (Item B10.3) for the core barrel assembly, baffle plates (Item B10) were removed.
- Expansion criteria for core barrel assembly, baffle plates (Item B10) was updated. The expansion criteria was updated to remove the expansion links to core barrel cylinder (including vertical and center circumferential seam welds) (Item B10.1) and lower grid rib section (Item B10.3) from the wording.
- Expansion criteria wording for the flow distributor assembly, flow distributor bolts (Item B12) was updated to include expansion to 100% of the lower thermal shield nuts.
- An expansion link for the incore monitoring instrumentation guide tube assembly, incore monitoring instrumentation guide tube spiders, and incore monitoring instrumentation guide tube spider-to-lower grid rib section welds (Item B15), was added. The expansion link added was upper grid fuel assembly support pad items: pad, Alloy X-750 dowel, cap screws, and their locking welds (Item B15.2). This item expands from the existing expansion item lower grid assembly, lower grid fuel assembly support pad component items: pad, pad-to-rib section welds, Alloy X-750 dowel, cap screws, and their locking welds (Item B15.1) as a secondary expansion as shown in the table below.

- New primary items were added:
  - Core barrel assembly, core barrel cylinder top flange circumferential weld heat affected zone (ONS Unit 2 only) (Item B16)
  - Core barrel assembly, core barrel cylinder center circumferential weld region (ONS Unit 2 only) (Item B17)
  - Lower Grid Assembly, lower grid rib section (B18)

The new Primary Items have the following Attributes:

Table B2.1.7-3: MRP-227-1-A Table 5-1, B&W Plants Acceptance and Expansion Criteria

Primary Component Item	Applicability	Primary Item Examination Criteria	Expansion Link	Expansion Criteria	Expansion Item Examination Acceptance Criteria
B16.Core Barrel Assembly Core Barrel cylinder top flange circumferential weld heat affected zone	ONS Unit 2	Enhanced visual (EVT-1) examination, ultrasonic (UT) examination, or eddy current (ECT) examination. The specific relevant condition is a detectable crack-like surface indication	None	None	None
B17.Core Barrel Assembly Core barrel cylinder center circumferential weld region	ONS Unit 2	Enhanced visual (EVT-1) examination, ultrasonic (UT) examination, or eddy current (ECT) examination. The specific relevant condition is a detectable crack-like surface indication	None	None	None
B18.Lower Grid Assembly Lower grid rib section	ONS Unit 1 ONS Unit 2 ONS Unit 3	Visual (VT-3) examination. The specific relevant condition is readily detectable cracking in the lower grid rib section.	None	None	None

Table B2.1.7-3: MRP-227-1-A Table 5-1, B&W Plants Acceptance and Expansion Criteria

Primary Component Item	Applicability	Primary Item Examination Criteria	Expansion Link	Expansion Criteria	Expansion Item Examination Acceptance Criteria
B15.Incore Monitoring Instrumentation Guide Tube Assembly a. Incore Monitoring Instrumentation guide tube spiders b. Incore Monitoring Instrumentation guide tube spider-to-lower grid rib section welds	ONS Unit 1 ONS Unit 2 ONS Unit 3	a.) Visual (VT-3) examination. The specific relevant conditions for the Incore Monitoring Instrumentation guide tube spiders are fractured or missing spider arms or a spider arm that does not align with the lower grid fuel assembly support pad screw (as viewed from the top). b.) Visual (VT-3) examination. The specific relevant conditions for the Incore Monitoring Instrumentation spider-to-lower grid rib section welds are separated or missing welds.	B15.1 Lower grid fuel assembly support pad component items: pad, pad-to-rib section welds, Alloy X-750 dowel, cap screw, and their locking welds. B15.2.Upper grid fuel assembly support pad items: pad, Alloy X-750 dowel, cap screws, and their locking welds.	Confirmed evidence of relevant conditions at two or more Incore Monitoring Instrumentation guide tube spider locations or Incore Monitoring Instrumentation guide tube spider-to-lower grid rib section welds shall require that the VT-3 examination be expanded to include accessible surfaces of the pads, dowels, cap screws, and associated welds for 100% of the lower fuel assembly support pads by the completion of the next refueling outage. Confirmed evidence of relevant conditions at two or more accessible surfaces of the pads, dowels, cap screws, and associated welds for 100% of the lower fuel assembly support pads shall require that the VT-3 examination be expanded to include accessible surfaces of the pads, dowels, cap screws, and associated welds for 100% of the upper fuel assembly support pads by the completion of the next refueling outage.	The specific relevant conditions for the VT-3 of the upper and lower grid fuel assembly support pad component items (pads, pad-to-rib section welds, Alloy X-750 dowels, cap screws, and their locking welds) are separated or missing welds, missing support pads, dowels, cap screws and locking welds, or misalignment of the support pads.

The *PWR Vessel Internals* AMP was implemented to support the PEO (60-years). The program requirements and implementation procedures have been previously reviewed and evaluated by the NRC Staff and a determination was made that the effects of aging will be adequately managed. Revisions to the ONS *PWR Vessel Internals* AMP as identified herein through the gap analysis, will ensure that the effects of aging will be adequately managed so that the reactor vessel internals intended function(s) will be maintained consistent with the CLB for the SPEO, as required by 10 CFR 54.21(a)(3).

NUREG-2191 Consistency

The *PWR Vessel Internals* AMP is an existing program that, following enhancements, will be consistent with NUREG-2191, Section XI.M16A, *PWR Vessel Internals*, as modified by SLR-ISG-2021-01-PWRVI, *Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors*, with the enhancements noted below.

Exception to NUREG-2191

None

Enhancements

The following enhancement(s) will be implemented to the following program element(s): Detection of Aging Effects (Element 4) and Acceptance Criteria (Element 6)

1. The *PWR Vessel Internals* AMP will be updated as necessary to provide guidance for implementing the changes to primary and expansion items in MRP-227, Rev 1-A, Tables 4-1, 4-4 (and Table 5-1 for Element 6 only), as modified by the ONS gap analysis for SLR reported in Appendix B2.1.7 of the ONS SLRA. (Elements 4 and 6)

Operating Experience

Based on a broad search of pertinent ONS and industry OE, the following examples provide objective evidence that the *PWR Vessel Internals* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In 2013, an INPO PWR materials review was conducted and included a review of the *PWR Vessel Internals* AMP. The review found that extensive preparations for Internals inspections for license renewal and 10-year interval inservice inspections resulted in the inspection of thousands of items in the reactor vessel and vessel internals during one refueling outage. The preparations included the use of integrated station and vendor planning, risk assessments, engineering preparations, contingency planning, repair plans, and remote non-destructive examination tooling. The review concluded that the extensive degree of inspection planning and execution was a beneficial practice.

OE example 1 provides objective evidence that the ONS program manager critically self-assesses program performance and self-identifies actions that support continuous improvement.

2. In 2014, an indication in the Oconee Unit 1 lower grid rib section was discovered while inspecting an adjacent component. Prior to discovery of the indication, inspection of the lower grid rib section was not required by MRP-227-A. As a result of this inspection finding, the lower grid rib section was added as an expansion component to MRP-227, Revision 1-A and is being upgraded to a primary item for SLR.

   OE example 2 provides objective evidence that plant-specific OE that potentially involves aging is evaluated and used to adjust the program as necessary.

3. In 2020, an AMP effectiveness review (AR 2336986-19) was performed for the *PWR Vessel Internals* AMP (UFSAR Section 18.3.20). The purpose of the review was to ensure that the *PWR Vessel Internals* AMP remained effective at detecting, monitoring, and managing the effects of aging so that in-scope components will continue to perform their intended functions during the period of extended operation. The review concluded that (a) every license renewal commitment had been resolved, and that planned updates to the program were being tracked; (b) initial exams for all components were performed in the fourth ISI Interval for each unit; (c) all relevant indications found during the inspections were entered into the corrective action program for resolution, and (d) all inspection results were transmitted to the EPRI materials reliability program within six months of the inspections.

   OE example 3 provides objective evidence that first LR program commitments and activities are being properly implemented to identify and manage aging effects of in-scope components. The corrective action program is being effectively used to evaluate and correct the identified deficiencies. Continued implementation of the program will assure degraded conditions will be identified and corrected during the SPEO.

OE examples 4 through 6 below represent industry events that have been evaluated using the corrective action program to identify potential impacts to the *PWR Vessel Internals* AMP. The ONS program manager actively participates in industry initiatives that evaluate and provide resolution of applicable OE items, such that adjustments to the program can occur. Through use of the corrective action program, these actions ensure that aging effects are addressed such that in-scope components will continue to perform their intended functions.

4. There is a history of baffle-to-former bolt ultrasonic test indications in the industry, likely due to irradiation-assisted stress corrosion cracking and/or fatigue affecting the bolts. For the initial MRP-227 inspections, this has primarily affected certain Westinghouse-designed units; guidance from the industry has been evaluated by the NRC. Evaluation in 2016 for potential impacts to ONS found that the ONS Internals design does not present the same characteristics that are attributed to the baffle-to-former bolt failures observed in certain Westinghouse units. It was concluded that the MRP-227 guidance concerning baffle-to-former bolt inspections was adequate at the time, and no additional actions were necessary.

5. During the spring 2018 MRP-227-A inspection of the core support barrel welds at a Combustion Engineering designed PWR, visual indications of cracking were observed adjacent to the middle girth weld and middle axial weld of the core support barrel, in and near the high neutron fluence core beltline region. A supplemental volumetric inspection of the area confirmed that the indications were flaws with some depth, and that none of the flaws had propagated through-wall. To date, no apparent cause has been determined, but the observations may be due to irradiation-assisted stress corrosion cracking. This OE resulted in further review of the B&W fabrication records including those for ONS. As a part of the records search, it was found that weld repairs occurred following post-weld stress relief of the ONS Unit 2 core barrel welds. The ONS program manager is actively involved in the industry response to this ongoing issue and is using the corrective action program to identify potential impacts and actions for the program, including a determination of the timing for inspections and improvements in core barrel inspection techniques.

6. Thermal shield attachment bolting failures have occurred recently at a Westinghouse 4-Loop downflow plant. While this condition does not impact the ability to achieve and remain in safe shutdown, operators of Westinghouse-designed PWR plants could likely identify this condition during their refueling outages which may impede access to the fuel assemblies for defueling operations. Evaluation in 2019 for potential impacts to ONS concluded that severed bolts will be prevented from backing out due to the B&W design. No further programmatic actions were found to be necessary.

OE examples 7 through 10 below describe relevant indications found during recent *PWR Vessel Internals* AMP inspections at ONS and the actions taken using the corrective action program. OE examples 7 through 10 provide objective evidence that program inspections, along with implementation of the corrective action program, effectively monitors in-scope structures and components to assure that these components will continue to perform their intended functions, and that appropriate aging management will be performed during the SPEO

7. Oconee Unit 1, 2012: (a) a crack-like indication was found on the vent valve jack-screw of one vent valve; (b) five lower core barrel bolts with crack-like indications were discovered during ultrasonic testing; (c) one lower core barrel bolt locking device was found with a missing weld on one side and a small weld on the other side; (d) four baffle-to-former bolts were not inspectable due to large welds on locking bars; and (e) one flow distributor bolt with a crack-like indication was discovered during ultrasonic testing. The corrective action program was used to address the relevant conditions identified during the examination. A causal evaluation found that the vent valve condition was legacy damage caused by contact with the plenum assembly as it was being manipulated during previous refueling outages. Contact between the vent valve and plenum assembly was found to be caused by inadequacies associated with the Internals lifting equipment; the lifting equipment issues were resolved. Other corrective actions included (a) extent-of-condition inspection of vent valves for the other ONS units (completed), (b) a procedural change to verify the correct vent valve jack screw configuration to help prevent damage during lifting of the plenum assembly (completed), and (c) an evaluation which showed that the accident analysis for core bypass flow bounded potential leakage past the damaged vent valve (completed). The vent valve was replaced. Actions to address the conditions found for other internals components included (a) structural evaluations (completed), (b)

evaluations of potential impacts to fuel performance (completed), and (c) loose parts evaluations (completed). These evaluations identified no impacts to the safe operation of the plant or to the ability of the Internals to perform their intended functions.

8. Oconee Unit 1, 2020: (a) twenty-five baffle-to-former bolts with crack-like indications were discovered during ultrasonic testing; (b) four baffle-to-former bolts were not inspectable due to large welds on locking bars (same results as those found in 2012); (c) a crack-like indication on the locking bar of one baffle-to-former bolt was discovered during ultrasonic testing. The corrective action program was used to address the relevant conditions identified during the examination. Actions taken to disposition the inspection results included (a) the use of structural analysis tools that considered the intact bolting pattern and projected failure simulations (completed), (b) one-cycle justification for continued operation (completed), (c) loose parts evaluation (completed), and (d) evaluation of programmatic changes to prevent loss of intended function (ongoing). The results of these evaluations identified no impacts to the safe operation of the plant or to the ability of the Internals to perform their intended functions.

9. Oconee Unit 2, 2013: (a) various issues were found with the vent valve jack-screw locking devices (see OE example 7); (b) one lower core barrel bolt with a crack-like indication was discovered during ultrasonic testing; (c) one barrel-to-former bolt was not inspectable due to incorrect probe seating; (d) two flow distributor bolts with crack-like indications were discovered during ultrasonic testing. The corrective action program was used to address the relevant conditions identified during the examinations. A causal evaluation found that the vent valve condition was legacy damage caused by contact with the plenum assembly as it was being manipulated during previous refueling outages. Contact between the vent valve and plenum assembly was found to be caused by inadequacies associated with the Internals lifting equipment; the lifting equipment issues were resolved. Other actions included an evaluation which showed that the accident analysis for core bypass flow bounded potential leakage past the damaged vent valve (completed). The vent valve was replaced. Actions to address the conditions found for other internals components included (a) structural evaluations (completed), (b) evaluations of potential impacts to fuel performance (completed), and (c) loose parts evaluations (completed). These evaluations identified no impacts to the safe operation of the plant or to the ability of the Internals to perform their intended functions.

10. Oconee Unit 3, 2014: (a) various issues were found with vent valve jack-screw locking devices (see OE example 7); (b) two upper core barrel bolts with crack-like indications were discovered during ultrasonic testing (same results as those found in 1984, 1985, and 1987); (c) three lower core barrel bolts with crack-like indications were discovered during ultrasonic testing (same results as those found in 1987); (d) one barrel-to-former bolt with a crack-like indication was discovered during ultrasonic testing; (e) one barrel-to-former bolt was not inspectable due to incorrect probe seating; (f) one flow distributor bolt with a crack-like indication was discovered during ultrasonic testing; (g) one incore monitoring instrumentation (IMI) guide tube spider casting weld was found with a linear indication just below the vertical weld toe in the base material of the lower grid; and (h) one incore monitoring instrumentation guide tube spider casting weld was found with a linear indication coming from the top of the casting at the weld toe and going downward into the casting material. The inspection of the lower grid section was considered to be an

ASME Section XI, Examination Category B-N-3 component, and not considered to be associated with an MRP-227-A primary item. Using the corrective action program, an evaluation found the vent valves to be acceptable for continued operation, and recommended that vent valve condition should be monitored during future valve exercise operations; this recommendation was captured in a procedure revision to re-examine the vent valves each refueling outage to verify the condition has not changed (completed). The IMI guide tube condition was addressed for acceptability for continued operation using the corrective action program with a structural and loose parts evaluation (completed). Actions to address the conditions found for other internals components included (a) structural evaluations (completed), (b) evaluations of potential impacts to fuel performance (completed), and (c) loose parts evaluations (completed). These evaluations identified no impacts to the safe operation of the plant or to the ability of the Internals to perform their intended functions.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *PWR Vessel Internals* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *PWR Vessel Internals* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience.

<u>Conclusion</u>

The implementation of the *PWR Vessel Internals* AMP will provide reasonable assurance that aging effects of the Oconee reactor vessel internals will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.8 FLOW-ACCELERATED CORROSION

Program Description

The *Flow-Accelerated Corrosion* AMP is an existing condition monitoring program that manages wall thinning caused by flow-accelerated corrosion in carbon steel piping and piping components exposed to reactor coolant, steam, and treated water environments. The program is based on commitments made in response to NRC GL 89-08, *"Erosion/Corrosion-Induced Pipe Wall Thinning,"* and relies on implementation of the Electric Power Research Institute (EPRI) guidelines in the Nuclear Safety Analysis Center (NSAC)-202L, Revision 4 for an effective flow-accelerated corrosion program.

CHECWORKS™ is used to predict component wear rates and remaining service life in the systems susceptible to flow-accelerated corrosion which provides reasonable assurance that structural integrity will be maintained between inspections. The model is revised if any changes in operating conditions or other factors that affect flow-accelerated corrosion (e.g., plant chemistry, power uprate) have occurred since the model was last updated. Changes may also result from plant modifications that effect flow-accelerated corrosion behavior such as material changes, the addition of piping systems, piping system configuration changes, and the addition or replacement of in-line components. The CHECWORKS™ model is also refined by importing actual volumetric inspection data thickness measurements and re-running wear rate analyses. This improves the predictive capability of the model to ensure that intended functions are maintained.

The program also manages wall thinning caused by mechanisms other than flow-accelerated corrosion in carbon steel and stainless steel piping and piping components exposed to treated water and treated borated water environments in situations where periodic monitoring is used in lieu of eliminating the cause of various erosion mechanisms.

The program includes: (a) identifying all susceptible piping systems and components; (b) developing flow-accelerated corrosion predictive models to reflect component geometries, materials, and operating parameters; (c) performing analysis of flow-accelerated corrosion models and, with consideration of OE, selecting a sample of components for inspections; (d) inspecting components; (e) evaluating and trending inspection data to determine the need for inspection sample expansion, repairs, or replacements, and to schedule future inspections; and (f) incorporating inspection data to refine flow-accelerated corrosion models.

Flow-accelerated corrosion inspections and inspections performed for wall thinning caused by mechanisms other than flow-accelerated corrosion that do not meet acceptance criteria are evaluated in accordance with the corrective action program.

NUREG-2191 Consistency

The *Flow-Accelerated Corrosion* AMP is an existing program that will be consistent with the ten elements of AMP XI.M17, *"Flow Accelerated Corrosion"* specified in NUREG-2191 with the enhancement described below.

Exception to NUREG-2191

None

Enhancements

The following enhancement will be implemented in the following program element: Detection of Aging Effects (Element 4)

1. Reassess infrequently used piping systems excluded from the scope of the program to ensure adequate bases exist to justify this exclusion for the SPEO. (Element 4)

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Flow-Accelerated Corrosion* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In September 2020, in accordance with NEI 14-12, a program effectiveness review was performed of the *Flow Accelerated Corrosion* program, as described in UFSAR Section 18.3.9. The purpose of the effectiveness review was to confirm that the intent of the existing AMP, which is to monitor the condition of flow-accelerated corrosion susceptible piping within the scope of LR, is being effectively implemented during the first PEO. The key aspects of the program were reviewed. The review confirmed that the program has been implemented in accordance with the commitments made when the original station operating license was renewed and that aging management activities have been completed as scheduled. Multiple aspects of the program were assessed, including the following: commitment management, implementing activity completion and results documentation, corrective actions, and OE. The effectiveness review found the *Flow Accelerated Corrosion* program is effective and intended functions will continue to be maintained consistent with the CLB for the SPEO.

   OE example 1 demonstrates that the *Flow Accelerated Corrosion* program is periodically reviewed for effectiveness. Continued implementation of the program will ensure degraded conditions will be identified and corrected during the SPEO.

2. In June 2012 during work activities to repair a pinhole leak in piping downstream of a test throttle valve, cavitation damage was identified. The valve and the affected piping are used during testing of an Oconee Unit 3 motor driven emergency feedwater pump. The valve and a portion of the downstream piping were replaced during the repair with stainless steel material to mitigate the effects of cavitation.

   The affected piping and valve were not subject to inspection by the *Flow Accelerated Corrosion* program because they had screened out for two reasons: 1) the temperature is less than 200^{o}F as well as single phase, and 2) the line containing the test valve is in service less than 2% of the plant operating time because it is used for testing.

A corrective action was generated to either modify the piping to eliminate cavitation or create preventive maintenance activities to periodically inspect points to monitor test valve and the downstream piping for cavitation. Preventive maintenance activities were created to monitor inspection points for the test valve and the downstream piping for cavitation as well as for the same locations on Oconee Unit 1 and Unit 2. Subsequent inspections were performed in 2017 for all three units and included 100% scan ultrasonic testing of the subject piping to ensure that any localized degradation due to cavitation was detected. Evaluation of the results of these inspections concluded the piping would remain fit for service through the next scheduled inspection in 2023.

OE example 2 provides objective evidence that plant-specific OE that potentially involves aging is evaluated and used to adjust the program as necessary. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality, address extent of conditions, and implement appropriate long-term actions.

3. In May 2016 several condenser tubes were identified to have experienced erosion on the tube outer diameter in the Oconee Unit 3 main condenser and there was concern the tubes may erode to the point portions of the tubes may become loose parts in the condenser. The issue was entered into the corrective action program for evaluation of the potentially adverse condition. The tubes identified as having erosion, the 1st and 2nd outermost rows of tubes, had previously been plugged based upon eddy-current test results and were no longer in service.

   A walkdown inside the condenser was executed to perform a close up visual inspection of the tubes that exhibited indications of external erosion. Additionally, eroded tubes were physically checked by grasping the tube and shaking to validate the tubes had rigidity and structural integrity. An engineering evaluation determined no tubes should be removed based on the visual and hands on inspection. It was also observed that the presence of out of service tubes along the periphery of tube bundles provides a level of protection to the in service tubes from steam erosion and potential impacts from foreign material intrusion.

   Condenser tubes that remain in service will continue to be periodically eddy-current tested for integrity and plugged when determined by an engineering evaluation. Out of service condenser tubes will be visually inspected periodically and evaluated for removal when erosion is identified.

   OE example 3 provides objective evidence that program inspections will effectively monitor in-scope SSCs to ensure that these components will continue to perform their intended functions, and that appropriate aging management will be performed during the SPEO. This OE also demonstrates the effectiveness of the corrective action program to identify and evaluate adverse conditions, and to drive appropriate enhancements in station programs and procedures.

4. In January 2019, a small bore piping leak occurred on Oconee Unit 2 upstream of a valve in Oconee Unit 2 moisture separator reheater 2nd stage reheater vent piping. There was no threat to unit operation and an extent of condition evaluation was performed. The leak was identified as a weld defect and a leak repair enclosure installed. However, a corrective action was initiated to drive the replacement of this piping during a future outage since the sister piping on Unit 1 and 3 had previously been replaced. The subject piping was subsequently replaced during the fall 2019 Unit 2 refueling outage. This was not a flow-accelerated corrosion induced leak, but the flow-accelerated corrosion program took the opportunity to proactively replace pipe since it was susceptible. The corrective action also proactively initiated work activities to have the 2nd stage reheater vent piping replaced with a flow-accelerated corrosion resistant material for all other Unit 2 moisture separator reheaters.

   OE example 4 demonstrates how the Oconee *Flow-Accelerated Corrosion* AMP effectively applies the corrective action program to identify and evaluate conditions adverse to quality. This example also demonstrates that the corrective action program is used effectively to implement appropriate long-term actions. The result was repair and upgrade of the piping to flow-accelerated corrosion resistant material at the next refueling outage as well as scope expansion to upgrade the piping of similar configuration to mitigate the possibility of a similar occurrence in the future.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Flow-Accelerated Corrosion* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Flow-Accelerated Corrosion* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

<u>Conclusion</u>

The implementation of the *Flow-Accelerated Corrosion* AMP, with the noted enhancement, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.9 BOLTING INTEGRITY

Program Description

The *Bolting Integrity* AMP is an existing condition monitoring program which manages loss of preload, cracking, and loss of material of safety related and non-safety related closure bolting on pressure-retaining components. The program utilizes recommendations and guidelines delineated in NUREG-1339, EPRI NP-5769, TR-1015336, and TR-1015337 for material selection, use of approved lubricants, proper torqueing, and leakage evaluations which are implemented during plant surveillance and maintenance activities.

The program activities provide for aging management of closure bolting on pressure-retaining components within the scope of SLR. The program includes periodic inspection of closure bolting on pressure-retaining components for indication of loss of preload, cracking, and loss of material. The program also credits visual inspection of pressure-retaining bolted joints in ASME Class 1, 2, and 3 systems for leakage and age-related degradation during system pressure tests performed in accordance with ASME Section XI. In addition, the *Bolting Integrity* AMP credits volumetric, surface, and visual inspections of ASME Section XI Class 1, 2, and 3 bolts, nuts, washers, and other associated bolting components performed in accordance with *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* (B2.1.1). The integrity of ASME and non-ASME pressure-retaining bolted joints which contain fluids such as water, oil, or steam is assessed by detection of visible leakage, evidence of past leakage, or other age-related degradation during walkdowns and maintenance activities. Conditions such as: degraded bolts, nuts and threads; active leakage; high noise levels; loose or missing bolts and nuts; evidence of past leakage; damaged insulation; discoloration; or other age-related degradation are documented in the corrective action program where the condition is evaluated. Resulting actions could include: operability evaluation, cause determination, extent of condition evaluation, additional or more frequent inspections, and replacement. This could include, when practical, projections of identified corrosion or degradation rates until the next scheduled inspection or replacement. Inspections are performed by personnel qualified in accordance with station procedures and programs to perform the specified task. Inspections within the scope of the ASME Code follow procedures consistent with the ASME Code. Non-ASME Code inspections follow station procedures that will include inspection parameters for items such as lighting, distance, and offset, which provide an adequate examination.

The program will perform periodic inspections of a representative sample of submerged closure bolting and closure bolting on pressure-retaining components within the scope of SLR that contain air or gas where leakage is difficult to detect. A representative sample is defined as twenty percent of closure bolting or a maximum of seventeen bolts for each material and environment population per unit. This sample size is appropriate because design, operating, and environmental conditions between the units are similar enough such that the aging effects are not occurring differently. All three units are of comparable age and changes to water chemistry practices, to plant equipment, and operating conditions have been implemented in a consistent manner across all three units. Water chemistry programs monitor various chemistry parameters and require out-of-spec conditions to be corrected under the corrective action program in a timely manner. Raw water systems for all three units draw from the same source, Lake Keowee. Therefore, a reduced sample size will provide a representative sample of the condition of the plant equipment and the existence of the aging effects involved.

The program also includes preventive measures such as use of EPRI guidance for the installation, makeup, and material selections of bolted joints; prohibition of the use of lubricants containing molybdenum disulfide; and minimizing the use of high strength bolting to preclude or minimize loss of preload and cracking.

High strength closure bolting greater than two inches in diameter (regardless of code classification) with yield strength greater than or equal to 150 ksi (1,034 MPa) will be visually inspected for aging affects and inspected volumetrically in accordance with ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1.

For sample based inspections in which acceptance criteria is not met the condition will be entered into the corrective action program. Conditions such as: loss of material; cracking; loss of preload; degraded threads; active leakage; loose or missing bolts or nuts; and evidence of past leakage will be documented and evaluated in the corrective action program. The degraded conditions will be evaluated relative to extent of condition against the total population of bolts under similar service conditions, to confirm the timing and extent of subsequent inspections to ensure the components' intended functions will be maintained throughout the SPEO. Site procedures will be enhanced such that, when required, there will be five additional inspections for each inspection that did not meet acceptance criteria or twenty percent of similar bolting (i.e., bolting with similar material, environment, and aging effect), whichever is less unless the cause of the aging effect is corrected by repair or replacement of all bolting constructed of the same material and exposed to the same service environment. The additional inspections will be completed within the inspection interval for which the original sample based inspections are conducted. The corrective action program will be used to adjust inspection frequencies based on projected degradation rates, if applicable, to ensure that loss of function does not occur prior to the next scheduled inspection.

The following bolting is not managed by the *Bolting Integrity* AMP.

1. The bolting components for the reactor vessel closure head are managed by the *Reactor Head Closure Stud Bolting* (B2.1.3) program.

2. The Primary Containment (MC) pressure-retaining bolting is managed as part of the *ASME Section XI, Subsection IWE* (B2.1.28) program.

3. ASME Class 1, 2, 3, and MC piping and components support bolting, including NSSS component supports, is managed as part of the *ASME Section XI, Subsection IWF* (B2.1.30) program.

4. Structural bolting, other than ASME Class 1, 2, 3, and MC piping and component supports bolting is managed as part of the Structures Monitoring (B2.1.33) program, or the *Inspection of Water-Control Structures Associated with Nuclear Power Plants* (B2.1.34) program.

5. Crane and hoist bolting is managed by the *Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* (B2.1.13) program.

6. Heating and ventilation system bolted joints are managed by the *External Surfaces Monitoring of Mechanical Components* (B2.1.23) program.

7. Pressure-retaining bolting in a buried environment or underground with restricted access are inspected in conjunction with buried piping and component inspections performed as part of the *Buried and Underground Piping and Tanks* (B2.1.26) program.

NUREG-2191 Consistency

The Oconee *Bolting Integrity* AMP will be consistent with the ten elements of AMP recommendations provided in NUREG-2191, Section XI.M18, "*Bolting Integrity*" with the enhancements listed below.

Exception to NUREG-2191

None

Enhancements

The following enhancements will be implemented in the following program elements: Preventive Actions (Element 2), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Corrective Actions (Element 7)

1. Revise applicable procedures and specifications to include reference to EPRI Report 1015336, EPRI Report 1015337, and NUREG-1339, as appropriate. (Element 2)

2. Revise procedures governing the direct visual examination of bolted joints to include inspection parameters such as lighting, distance, and offset. (Element 4)

3. Perform volumetric inspections of non-ASME high-strength bolting greater than two inches in diameter in accordance with the method described in ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1. (Elements 3 and 4)

4. Perform visual inspections of a representative sample of twenty percent of closure bolting where leakage is difficult to detect such as submerged connections or systems containing air/gas or a maximum of seventeen bolts for each material and environment population per unit, whichever is less, during each ten year period. If the minimum sample size is not achieved during a ten year period, then alternative inspections may be performed. For submerged bolting, alternative inspections may include (a) diver inspections or (b) remote video inspections. For systems containing air/gas, alternative inspections may include (a) visual inspection for discoloration when leakage from inside the piping system would discolor the external surfaces of the component; (b) monitoring and trending of pressure decay when the bolted connection is located within an isolated boundary; (c) soap bubble testing on the external mating surface of the bolted component; or (d) thermography, when the temperature of the process fluid is higher than ambient conditions around the component. (Element 4)

5. Perform additional inspections of a minimum of twenty percent of similar bolting or five additional inspections, whichever is less, when sample based inspections do not meet acceptance criteria. If the additional inspections identify bolting that does not meet acceptance criteria, then an extent of condition and extent of cause analysis will be conducted to determine the further extent of inspections. Additional inspections of similar bolting will be performed at all three units and will occur within the same interval in which the original inspection was conducted. The corrective action program will be used to determine if changes to inspection frequency is appropriate if any inspection results indicate that loss of function will occur prior to the next scheduled inspection. (Element 7)

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Bolting Integrity* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. During the Spring 2011 Unit 1 refueling outage, while work was being performed in containment, loose bolting was identified on the pressurizer vent and nitrogen isolation valve, which was located in the area where work was being performed. The issue was entered into the station corrective action program to have the issue investigated and resolved. The bolting was removed and re-torqued prior to restarting the unit following the refueling outage.

   OE example 1 provides objective evidence that station maintenance practices and the corrective action program effectively monitor and maintain the condition of bolting to ensure that these components will be able to continue to perform their intended functions during the SPEO.

2. In August 2012, the NRC issued Information Notice 2012-15, “Use of Seal Cap Enclosures to Mitigate Leakage from Joints that Use A-286 Bolts,” to inform licensees of the potential issues associated with the installation of seal cap enclosures to mitigate leakage from A-286 bolted connections. An unintended consequence of installation of seal cap enclosures was cracking due to the stress corrosion cracking resulting from submergence of Alloy A-286 (Grade 660) flange bolting in leaked primary coolant. The environment inside of an enclosure that is installed on a leaking flange is not necessarily similar to the high-purity, low-oxygen environment inside a PWR reactor coolant system. Electrochemical reactions that cause stress corrosion cracking are likely to occur with the A-286 bolting and enclosure attachment welds.

   Based on a plant review, it was determined that there are no valves at Oconee that have seal cap enclosures installed. In addition, leak repair devices such as seal cap enclosures described in this industry OE are treated as a temporary fix requiring further follow-up action to permanently correct the problem.

OE example 2 provides objective evidence that industry OE relevant to aging management is evaluated and used to adjust the program as necessary.

3. In May 2012, significant corrosion was identified on carbon steel flange bolting for two low pressure service water system flexible hoses. The issue was documented in the corrective action program and a work request was initiated to replace the carbon steel bolting with stainless steel during the next refueling outage. The flanges for the flexible hoses are stainless steel and showed no indication of degradation. The carbon steel bolting was replaced with stainless steel during the Spring 2014 Unit 3 refueling outage.

   OE example 3 provides objective evidence that the corrective action program is appropriately utilized to evaluate degraded conditions and initiate appropriate corrective actions to prevent recurrence.

4. In April 2017, during VT-2 examinations of a nearby component, dry boron was identified on two valves. The issue was entered into the station corrective action program for resolution. Work orders were created for each of the valves to clean up the boron and remove insulation to inspect. Leaks were identified at the body to bonnet interface. The areas were cleaned and inspected for corrosion, no corrosion was identified as both valves and bolting were made of materials that are not susceptible to boric acid corrosion. The bolting for both valves were re-torqued to the appropriate values in accordance with station procedures. The issue was documented in the station fluid leak management database.

   OE example 4 provides objective evidence that existing inspection activities credited by this program and the corrective action program effectively monitor and maintain the condition of bolting to assure that these components will be able to continue to perform their intended functions during the SPEO.

5. In December 2017, during the performance of a radiation protection survey, a leak was observed coming from the Unit 1 borated water storage tank manway. The issue was investigated and it was determined that there was an active leak of approximately one drop every two to three minutes from a manway bolt. The issue was entered into the corrective action program and the station's fluid leak management database. A work request was issued to re-torque the manway bolting. The borated water storage tank manway bolting was re-torqued, and the area was monitored to confirm that leakage had ceased.

   OE example 5 provides objective evidence that system leakage monitoring by station personnel during normal work activities is effective in identifying evidence of minor leakage that could indicate degraded bolting. The example also provides objective evidence that the corrective action program is appropriately utilized to ensure appropriate corrective actions are performed.

6. In January 2018, several small defects were identified in 5/16" bolting for the Keowee Unit 1 turbine guide bearing oil system heat exchanger end bell. The defects are outside of the thread engagement area and do not impact the integrity of the joint. The condition was

documented in the corrective action program for evaluation. The bolting was evaluated and determined to be acceptable for continued service.

OE example 6 provides objective evidence that opportunistic inspections of component closure bolting performed during normal maintenance activities are capable of detecting minor issues prior to loss of intended function.

7. A review of ten years (January 2011 through January 2021) of condenser circulating water system pump diver inspections was performed which identified no significant issues with the submerged bolting for these pumps. The four pumps at each of the three units have been inspected four to five times over the ten years that have been reviewed. Inspections have identified a layer of surface corrosion and corrosion nodules on the bolting and pump column which is typical in a submerged raw water environment. No significant loss of material which could impact intended functions has been detected.

   Marine growth and biofouling material have also been identified. No loose, missing, or broken submerged bolting has been detected in any of the inspections completed over the ten year review period.

   OE example 7 provides objective evidence that appropriate inspections are performed to monitor the condition of submerged bolting and that significant aging which could impact intended functions of this bolting is not occurring.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Bolting Integrity* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, re-evaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Bolting Integrity* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Bolting Integrity* AMP, with the enhancements noted above, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.10 STEAM GENERATORS

Program Description

The *Steam Generators* AMP is an existing condition monitoring program that manages the aging effects of cracking, loss of material (e.g., wall thinning), and reduction of heat transfer for the steam generators. The scope of the program includes primary-side components (e.g., tubes, plugs, lower/upper heads, tubesheet, etc.), and secondary-side components that are contained within the steam generator. The program performs volumetric inspections for the tubes, and visual inspections for the other primary-side and secondary-side components. The visual inspections of steam generator components in the scope of this AMP are performed in accordance with the degradation assessment that is prepared as each steam generator is scheduled for examination. The Oconee program does not address divider plate assemblies since the design of the steam generators in all three units does not include these components.

The *Steam Generators* AMP uses industry endorsed guidance regarding tube inspections, evaluation and repair, and leakage monitoring techniques to ensure tube integrity of the steam generators. Aging is managed through assessment of potential degradation mechanisms, inspections, tube integrity assessments, plugging and repairs, primary-to-secondary leakage monitoring, maintenance of secondary side component integrity, primary-side and secondary-side water chemistry, and foreign material exclusion. Implementing procedures specify the performance criteria for tube integrity, condition monitoring requirements, inspection scope and frequency, acceptance criteria for the plugging or repair of flawed tubes, acceptable tube repair methods, leakage monitoring requirements, and operational leakage and accident-induced leakage requirements from Technical Specifications.

Provisions in the *Steam Generators* AMP address reporting criteria, inspection scope and frequency, assessments, plugging criteria, and water chemistry monitoring to maintain consistency with established requirements. Those requirements appear in the following documents:

- Technical Specifications
- Maintenance Rule (10 CFR 50.65)
- EPRI 3002007571, *"Steam Generator Integrity Assessment Guidelines"*
- EPRI 3002007572, *"PWR Steam Generator Examination Guidelines"*
- EPRI Technical Report TR1022832, *"PWR Primary-to-Secondary Leak Guidelines"*
- EPRI 3002007856, *"Steam Generator In-Situ Pressure Test Guidelines."*

The EPRI guidelines provide a generic industry program to implement the expectations from NEI 97-06, Revision 3, *"Steam Generator Program Guidelines."*

The Oconee *Steam Generators* AMP complies with the guidance provided in NEI 97-06, *Steam Generator Program Guidelines*, and its referenced industry guideline documents for inspections, personnel qualification, and technique qualification. NEI 97-06 was developed by the industry to meet 10 CFR 50.65 maintenance rule and other applicable regulatory requirements and establish the elements of an effective steam generator management program. The frequency of examinations and acceptance criteria are specified in Oconee Technical Specifications.

The original steam generators were replaced for Unit 1 in 2003 and for Unit 2 and 3 in 2004. Each replacement steam generator on the three units have tubes constructed of thermally treated Alloy 690 material to improve reliability and minimize aging.

The *Steam Generators* AMP includes plant-specific steam generator degradation assessments that identify existing and potential degradation mechanisms and associated aging effects that could impact the integrity of the steam generators. The degradation assessment identifies qualified tube inspection techniques and defines the scope of inspections that are appropriate for the detection and characterization of those aging effects, which consist of cracking, loss of material (e.g., wall thinning), and reduction of heat transfer. As stated in the degradation assessment, steam generator inspections are performed every 72 effective full power months or at least every third refueling outage (whichever results in more frequent inspections) for each steam generator, thus satisfying the Oconee Technical Specifications and industry guidance for inspections to be performed at least every 72 effective full power months or every third refueling outage, whichever results in more frequent inspections. The minimum number of tubes inspected at each scheduled inspection shall be the number of tubes in all steam generators divided by the number of steam generator inspection outages scheduled in each inspection period. Since the inspection scope to date at Oconee has been 100% on each generator for each unit during each refueling outage, inspection interval requirements have been readily met.

The degradation assessment includes a review of relevant industry and plant-specific OE which has occurred since the previous degradation assessment was performed. The degradation assessment review determines the existence of any unaddressed mechanism that could adversely affect steam generator primary-side or secondary-side integrity, as well as the effects of any chemistry excursions or transients that could affect existing degradation mechanisms. An excursion of secondary chemistry could lead to fouling of heat transfer surfaces and a reduction of heat transfer thermal performance.

The aging effects managed by the *Steam Generators* AMP include cracking, loss of material (e.g., wall thinning), and reduction of heat transfer for the steam generators. The scope of the program includes primary-side components (e.g., tubes, plugs, lower/upper heads, tubesheet, etc.), and secondary-side components that are contained within the steam generator. The program uses volumetric inspections for the tubes, and visual inspections for the other primary-side and secondary-side components. The visual inspections of steam generator components are performed in accordance with the degradation assessment that is prepared as each steam generator is scheduled for examination, including steam generator head primary side stainless steel cladding surfaces. The primary side surfaces of Oconee replacement once through steam generator tubesheets are clad with nickel alloy and the Alloy 690 thermally treated tubes are joined to the tubesheet with autogenous welds. General steam generator inspection activities are credited to identify rust stains indicative of degradation (loss of material) of tubesheet or tube-to-tubesheet weld primary side surfaces.

The *Steam Generators* AMP includes preventive measures to mitigate aging related degradation through foreign material exclusion as a means to inhibit tube degradation due to wear. Identification of deposits on the secondary side of the steam generator, and the subsequent removal of sludge deposits helps prevent tube degradation. As an additional preventive measure, the *Water Chemistry* program monitors and controls reactor water chemistry and secondary water chemistry for the steam generators consistent with EPRI 3002000505, *"PWR*

Primary Water Chemistry Guidelines," and EPRI 3002010645, *"PWR Secondary Water Chemistry Guidelines"*.

Oconee Technical Specifications include the following requirements which have been incorporated in the *Steam Generators* program:

- Conducting condition monitoring assessments for each refueling outage during which steam generator tubes are inspected or plugged.
- Maintaining steam generator tube integrity by meeting performance criteria for tube structural integrity, accident-induced leakage, and operational leakage.
- Installing plugs in tubes found by inservice inspection to contain flaws with a depth equal to, or exceeding, 40% of the nominal tube wall thickness.
- Performing periodic inspections of steam generator tubes. Inspection scope, methods, and interval ensure that tube integrity is maintained until the next planned inspection.
- Monitoring primary-to-secondary leakage.
- Monitoring secondary water chemistry to ensure controls are in place to inhibit steam generator tube degradation.

Non-destructive examination techniques are used to inspect tubing materials in order to identify tubes that may need to be removed from service in accordance with technical specifications. The *Steam Generators* program utilizes volumetric examination techniques for the tubes, and visual examinations for other primary-side and secondary-side components. The *Steam Generators* program defines specific examination techniques, and describes criteria for the qualification of personnel, and for the acquisition and analysis of data. Assessment of tube integrity and plugging criteria of flawed tubes is in accordance with the technical specifications and the *Steam Generators* program implementing procedures. Tube plugs with indications of aging are evaluated for corrective actions in accordance with the corrective action program and the *Steam Generators* program.

Condition monitoring assessments are performed to determine whether structural and accident leakage criteria have been satisfied during the previous operating cycle(s). Operational assessments are performed after inspections are completed to verify that structural and leakage integrity will be maintained for the operating interval between inspections, which is selected in accordance with Technical Specifications and EPRI *Steam Generator Integrity Assessment Guidelines*. Comparison of the results of the condition monitoring assessment with the predictions of the previous operational assessment provides feedback for evaluation of the adequacy of the operational assessment and additional insights that can be incorporated into the next operational assessment. The condition monitoring, and performance monitoring methods, are effective in detecting the applicable aging effects, and the frequency of monitoring is adequate to prevent significant age-related degradation.

<u>NUREG-2191 Consistency</u>

The Oconee *Steam Generators* AMP is an existing program that is consistent with the ten elements of AMP XI.M19, "Steam Generators" specified in NUREG-2191 (GALL-SLR).

<u>Exception to NUREG-2191</u>

None

<u>Enhancements</u>

None

<u>Operating Experience</u>

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Steam Generators* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In 2005, during the first inservice inspection of the Oconee Unit 1 replacement once through steam generators, widespread tube wear caused by tube vibration was detected at support plate intersections. An entry was made into the corrective action program to document, evaluate and perform actions, as necessary. Completed corrective actions included performing an inspection of all tubes on both the 1A and 1B steam generator, operability assessment, root cause analysis involving a detailed review of the thermal hydraulic, structural, and operating conditions of the replacement once through steam generators, and flaw analysis and growth rate determination. In addition, eddy current testing field data of the observed wear was studied and additional field data was collected in support of the root cause analysis. The root cause investigation concluded that the tube wear was a result of inadequate lateral support resulting from tube to support plate relative alignment. This design allowed too much freedom of movement, which enabled small excitation forces to cause tube vibration. This tube vibration resulted in low load, high cycle impact of the tubes with the support plates which produced wear scars on the tubes. As a corrective action, a high-confidence tube plugging predictive model was developed and validated to confirm steam generator service life and support a managed approach with all Oconee replacement once through steam generators going forward. A tube plugging projection model that fully considers design specific tube wear mechanisms is continually applied and validated as part of Oconee *Steam Generators* AMP degradation assessment, condition monitoring, and operational assessment activities. An extent of condition was also performed which concluded that the replacement once through steam generators for all three Oconee units are susceptible to the same tube vibration induced degradation mechanism.

   A separate entry was made into the corrective action program to document the operability evaluation and condition of Units 2 and 3 steam generators. Corrective actions initiated and completed included the implementation of a monitoring activity to recognize and evaluate any changes in plant operation (e.g., power reductions) that could impact the assumptions made regarding the steam generator tube-to-tube support plate wear rates. Other actions included inspecting all tubes in both Unit 2 and 3 for baseline wear information and validation of wear rate assumptions. While the tube wear observed on

Units 2 and 3 steam generators was less widespread, the pattern of wear and geometry of the wear scars was essentially the same, suggesting the same phenomenon is occurring on all units. An additional action involving all three Oconee units included establishing a steam generator health report action plan to monitor the operation of Oconee Units 1, 2, and 3 for any changes (e.g., reduced power for extended period of time) that could affect the assumptions made regarding the tube-to-tube support plate wear rates in the replacement steam generators.

OE example 1 provides objective evidence that plant-specific OE, that potentially involves aging, is evaluated and used to modify the *Steam Generators* program. This example also demonstrates that proper extent of condition is performed to initiate additional corrective actions, as needed.

2. In September 2009, the NRC issued RIS 2009-04, *"Steam Generator Tube Inspection Requirements,"* to clarify the regulatory position on the implementation of the steam generator tube inspection requirements contained within plant's Technical Specifications. An item was entered into the corrective action program to evaluate the RIS across the Duke Energy fleet. The Oconee Technical Specifications and *Steam Generators* aging management activities were reviewed and found to be consistent with the guidance and interpretations provided in RIS 2009-04. No further action was needed.

   OE example 2 demonstrates the effective use of the corrective action program to identify and evaluate updated industry steam generator inspection and maintenance guidance and to adjust programs, as necessary.

3. In November 2011, during the first inservice inspection of replacement once through steam generators at a domestic PWR facility, tube-to-tube contact wear was identified and reported as industry OE. An entry was made to the corrective action program to evaluate and initiate corrective actions for each Oconee unit, as necessary. As a result, the Oconee *Steam Generators* AMP was modified to update the potential degradation mechanisms and improve the detection criteria.

   OE example 3 demonstrates the effective use of industry OE and the corrective action program to identify degraded conditions and to adjust programs, as necessary.

4. In the fall of 2014, a corrective action program entry was made to evaluate the non-destructive examination results for the Oconee 1A steam generator. The results collected during the fall outage indicated that tube wear was under predicted by the operational assessment analysis performed following the previous fall 2012 inspection. The measured wear indication for one tube was 59% through wall. The indication was under predicted by 1.4% through wall. The operational assessment performed following the previous inspection predicted the largest wear indication would be 57.6% through wall during the fall 2014 outage. The tube met the acceptance criterion and was within the margin of error for the operational assessment. In response to this under prediction observation, the growth rate assumptions applied in operational assessments were adjusted upward to make more bounding predictions.

OE example 4 provides objective evidence that the program manager critically self-assesses program performance and self-identifies actions in the corrective action program that support continuous improvement.

5. In 2016, a corrective action was initiated to evaluate actions that could be taken to address spiral wound gasket material foreign material intrusion events into the Oconee 1A steam generator. An engineering evaluation determined that the 1A1, 1B1, 1B2, 2B1 and 2B2 feedwater manway gaskets should be replaced with a similar 304SS, spiral-wound gasket that incorporates an inner retaining ring that prevents deterioration in a manner that generates foreign material.

   OE example 5 provides objective evidence that the existing AMP activities are being effectively implemented to identify and manage aging effects of in scope components and that the results of inspection activities are used to inform and enhance the program. Deficiencies identified during inspection activities are entered into the corrective action program and appropriate corrective actions are taken to evaluate and address deficiencies.

6. In 2016, a corrective action program entry was made to document a cladding defect found during inspections in a recirculating steam generator at Catawba Nuclear Station. This inspection was being performed in response to NSAL-12-1 and NRC Information Notice 13-20 industry OE. As a result of this OE at another Duke site (Catawba), the Oconee *Steam Generators* AMP was modified to improve the inspection program. Although the Catawba recirculating steam generators are of a different design than the Oconee replacement once through steam generators, the OE is applicable to the primary side surfaces of once through steam generator upper/lower heads at Oconee. Following the discovery of the cladding anomaly in the Catawba steam generator, replacement once through steam generator upper/lower head primary side stainless steel cladding visual inspections were performed at Oconee with the following enhancements:

   - The inspections covered all the visible upper/lower head primary side surfaces.
   - Lighting utilized was comparable to the enhanced Catawba inspection practice to ensure adequate illumination to identify any rust colored stains or dark discolorations on the primary side surfaces of the upper/lower heads
   - Cameras capable of detecting rust colored staining and discolorations of the cladding that are indicative of possible cladding issues were deployed

   To date there have been no findings of stainless-steel cladding degradation at any Oconee or other once through steam generator installation.

   OE example 6 demonstrates the effective use of industry OE and the corrective action program to identify degraded conditions, perform extent of condition reviews, and take timely corrective action to ensure aging effects and conditions adverse to quality are identified, and to assure steam generator components continue to perform their intended functions.

7. In November 2017, a corrective action program entry was made to document the foreign material found on the primary side bottom head bowl of the Oconee 2B steam generator.

The foreign object found was confirmed to be a piece of fuel grid strap measuring approximately ¾ inch by ½ inch long. The debris was likely dislodged from a tube during eddy current testing. The material was evaluated by the metallurgical lab and determined to be a piece of legacy fuel grid strap debris from a previous fuel cycle (2011 or prior). The foreign object was removed from the system, and a complete visual inspection of the 2B hot leg and cold bowl stainless steel liner and primary tube-sheet face was performed during the Oconee Unit 2 fall 2017 refueling outage. No indications of damaged primary side cladding were noted. This foreign material intrusion event had the potential to damage tubes, but no tube damage was identified by non-destructive examination of the tubes. No issues were noted beyond expected wear.

OE example 7 demonstrates that condition reports are initiated in the corrective action program and that appropriate cause evaluations and inspections are being performed in response to identified primary side foreign material intrusion events. This OE provides objective evidence that program inspections, along with the corrective action program, will effectively monitor in scope steam generator components to assure that these components will continue to perform their intended functions during the SPEO.

8. In August 2020, an AMP effectiveness review was performed on the *Steam Generators* program. The AMP was evaluated against the performance criteria identified in NEI 14-12, *"Aging Management Program Effectiveness."* The review concluded that the steam generators program is meeting the requirements of NEI 14-12. No gaps were identified by the effectiveness review.

   This effectiveness review provides objective evidence that the current *Steam Generators* program is effectively managing aging and meeting all current LR commitments. This provides reasonable assurance that ongoing program effectiveness will continue in the SPEO.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Steam Generators* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, re-evaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Steam Generators* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Steam Generators* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.11 OPEN-CYCLE COOLING WATER SYSTEM

Program Description

The *Open-Cycle Cooling Water System* AMP is an existing preventive, mitigative, condition monitoring and performance monitoring program based on the implementation of NRC GL 89-13, and includes non-safety related portions of the open cycle cooling water system. The program includes: (a) surveillance and control to significantly reduce the incidence of flow blockage problems as a result of biofouling, (b) tests to verify heat transfer of heat exchangers, (c) periodic inspection and maintenance so that corrosion, erosion, cracking, fouling, and biofouling cannot degrade the performance of systems serviced by the open cycle cooling water systems, and (d) reevaluation, repair, or replacement of components that do not meet minimum wall thickness requirements. The program applies to components constructed of various materials including steel, gray cast iron, ductile iron, stainless steel, and copper alloys exposed to raw water from Lake Keowee. There is no cementitious or polymeric piping within the scope of the program. This program includes guidance beyond the requirements contained in NRC GL 89-13, such as inputs from industry reports and documents (e.g., EPRI documents) that address OE such that aging effects are adequately managed.

The program manages piping, piping components, and heat exchanger components in safety related and non-safety related raw water systems that are exposed to a raw water environment for loss of material, cracking, reduction of heat transfer, and flow blockage. The program also manages loss of coating integrity for certain components that do not perform a pressure boundary intended function and where loss of coating integrity would not impact the intended functions of downstream components. System and component testing, flushing, visual inspections, and nondestructive examination are conducted to ensure that identified aging effects are managed such that system and component intended functions and integrity are maintained.

The program includes those plant systems that transfer heat from safety related SSCs to the ultimate heat sink as defined in GL 89-13. Periodic heat transfer testing, visual inspection, and cleaning of safety related heat exchangers with a heat transfer intended function is performed in accordance with the site commitments to GL 89-13 to verify heat transfer capabilities. Test results and the results of visual inspections that do not meet acceptance criteria are evaluated in accordance with the corrective action program. The results of heat transfer testing are trended to verify adequacy of testing frequencies.

Safety related piping is nondestructively examined to ensure that there is no loss of material which could result in loss of intended function. Examinations that do not meet acceptance criteria are evaluated in accordance with the corrective action program. For ongoing degradation due to specific aging mechanisms (e.g., microbiologically influenced corrosion), the program includes trending of wall thickness measurements at susceptible locations to adjust the monitoring frequency and the number of inspection locations.

Personnel qualified in accordance with station procedures and programs to perform the specified task are utilized to perform testing and nondestructive examinations of equipment within the scope of this program. Inspections within the scope of the ASME Code follow procedures consistent with the ASME Code.

Aging effects associated with non-service water raw water systems (e.g., filtered water system, drinking water system) are managed by the *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* (B2.1.24) program.

Aging of water-based fire suppression systems, other than recurring internal corrosion, is managed by the *Fire Water System* (B2.1.16) program.

NUREG-2191 Consistency

The *Open-Cycle Cooling Water System* AMP is an existing program that will be consistent with NUREG-2191 Section XI.M20, *Open-Cycle Cooling Water System* with enhancements and exceptions, as described below

Exception 1 to NUREG-2191

Program Element Affected: Scope of Program (Element 1)

1. The *Open-Cycle Cooling Water System* AMP will manage recurring internal corrosion of steel piping in the station's water-based fire suppression systems in addition to the scope specified in NUREG-2191, Section XI.M20.

   Justification for Exception 1

   A review of Oconee OE indicates that recurring internal corrosion, as defined in Section 3.3.2.2.7 of NUREG-2192, is occurring in steel piping exposed to raw water from Lake Keowee. This includes open-cycle cooling water systems and water-based fire suppression systems which are both supplied from Lake Keowee. The water-based fire suppression systems are of similar design and construction as the open-cycle cooling water systems managed by this program. Since the material of construction and service environment are equivalent between the open-cycle cooling water systems and the water-based fire suppression systems, managing recurring internal corrosion of these systems as a single population is appropriate.

   The Oconee *Open-Cycle Cooling Water System* AMP will manage recurring internal corrosion of steel piping exposed to raw water through sample-based volumetric inspections. A minimum of twenty inspections will be performed every 24 months until the rate of recurring internal corrosion occurrences no longer meets the criteria for recurring internal corrosion as defined in Section 3.3.2.2.7 of NUREG-2192. Inspections will be performed in both open-cycle cooling water systems and water-based fire suppression systems in representative sample locations with conditions that are characteristic of the conditions found throughout raw water filled systems at Oconee. Inspection results will be extrapolated to similar locations throughout all the raw water systems within the scope of SLR and used to assess the general condition of piping exposed to raw water. This characteristic-based approach recognizes the commonality among the component materials of construction and the environment to which they are exposed.

Enhancements

The following enhancements will be implemented in the following program elements: Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), Corrective Actions (Element 7), and Administrative Controls (Element 9)

1. Perform periodic inspection, cleaning, and eddy current testing of the ‘A’ and ‘B’ Chiller condensers at least once every five years. (Element 3)

2. Perform a minimum of twenty inspections for recurring internal corrosion in raw water systems every 24 months until the rate of recurring internal corrosion occurrences no longer meets the criteria for recurring internal corrosion as defined in Section 3.3.2.2.7 of NUREG-2192. The selected inspection locations will be periodically reviewed to validate their relevance and usefulness and adjusted as appropriate. Evaluation of the inspection results will include (1) a comparison to the nominal wall thickness or previous wall thickness measurements to determine rate of corrosion degradation; (2) a comparison to the design minimum allowable wall thickness to determine the acceptability of the component for continued use; and (3) a determination of re-inspection interval. (Element 3, 4, 5 and 7)

3. Perform periodic internal visual inspections of the visible portion of the supply and return piping to the radwaste equipment cooling system from the condenser circulating water system intake piping in conjunction with the performance of the intake piping internal coating inspections. Visual inspections will be performed to identify direct evidence of internal degradation and indirect evidence of through wall leakage including the presence of backfill material or gravel within the pipe. (Elements 3 and 4)

4. Provide additional guidance in procedures for inspections of non-ASME Code components for items such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes. (Element 4)

5. Provide additional guidance for trending of heat exchanger inspection results to evaluate the adequacy of inspection frequencies. (Element 5)

6. If inspections identify wall-thickness below the minimum required wall thickness and the cause of the aging effect for each applicable material and environment is not corrected by repair or replacement for all components constructed of the same material and exposed to the same environment, additional inspections will be conducted. The number of increased inspections is determined in accordance with the corrective action program; however, no fewer than five additional inspections will be conducted for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination is inspected, whichever is less. The additional inspections include inspections at all of the units with the same material, environment, and aging effect combination. (Element 7)

7. Incorporate programmatic guidance contained in engineering support documents into controlled plant procedures subject to administrative controls in accordance with the Duke Energy QA Program. (Element 9)

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Open-Cycle Cooling Water System* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In 2019, a self-assessment of LR aging management activities was performed which included a detailed review of select AMPs and commitments. In 2020, an effectiveness review of existing AMPs and activities required by commitments made during the first LR was performed for all programs and activities not adequately assessed during the 2019 self-assessment. Although the *Open-Cycle Cooling Water System* AMP is not one of the existing AMPs documented in Chapter 18 of the Oconee UFSAR, there are multiple programs and aging management activities developed for the first LR that are relevant to this program, some of which were included in the 2019 self-assessment while others were addressed during the 2020 AMP effectiveness reviews. These Chapter 18 programs and aging management activities include: heat exchanger performance testing activities (UFSAR Section 18.3.11), chilled water refrigeration unit preventive maintenance activity (UFSAR Section 18.3.17.2), decay heat cooler tubing examination (UFSAR Section 18.3.17.7), jacket water heat exchanger preventive maintenance activity (UFSAR Section 18.3.17.9), Keowee turbine generator cooling water system strainer inspection (UFSAR Section 18.3.17.10), main condenser tubing examination (UFSAR Section 18.3.17.11), reactor building cooling unit tubing inspection (UFSAR Section 18.3.17.13), standby shutdown facility HVAC coolers preventive maintenance activity (UFSAR Section 18.3.17.15), Keowee turbine guide bearing oil cooler examination (UFSAR Section 18.3.17.22), and service water piping corrosion program (UFSAR Section 18.3.21). The relevant results of the 2019 assessment and 2020 effectiveness reviews are summarized below.

   The overall results of the 2019 assessment and 2020 effectiveness reviews confirmed that the various programs and activities are being implemented as described in Chapter 18 of the Oconee UFSAR. In addition, reviews of the corrective action program performed during the evaluation of these AMPs and activities did not identify any significant aging issues or failures that would require changes or enhancement to the existing programs. The review also confirmed that when changes were made to commitments or implementing activities, the impact on aging was considered, with one exception described below. Based on the above, it is concluded that the existing AMPs and activities have been effective at managing age-related degradation of raw water system components at Oconee.

   Most of the discrepancies identified during this review were related to documentation and record keeping. For example, the basis for scheduled preventive maintenance activities, as documented in the Oconee work management system, often lacked sufficient detail to determine the specific activities required by commitment. This represents a challenge to the work management process (e.g., when evaluating potential preventive maintenance changes or deferrals) but has not resulted in any missed commitments. The review also identified instances where completed inspection records were not submitted to permanent records as required. The issues related to documentation and record keeping have been entered into the corrective action program to evaluate opportunities for process improvements.

In one instance, an aging management activity was changed without fully evaluating the impact on aging and commitment compliance. In 2018, the ‘A’ chiller was replaced. Aging of the condenser for the chiller is managed by the chilled water refrigeration unit preventive maintenance activity (UFSAR Section 18.3.17.2). Following the replacement of the ‘A’ chiller, several preventive maintenance recurring work orders were retired due to differences between the original chiller design and the replacement. The retired preventive maintenance recurring work orders included four year cleaning and eddy current testing which is credited in UFSAR Chapter 18 for aging management of the chiller condenser. Based on the four year frequency, cleaning and eddy current testing of the condenser would not be required until 2022. This issue has been documented in the corrective action program to review the preventive maintenance changes and determine if the preventive maintenance recurring work orders will be reestablished or if a commitment change will be processed.

Finally, the review identified discrepancies or potential discrepancies between aging management implementation details as described in NUREG-1723, Safety Evaluation Report related to the LR of Oconee Units 1, 2, and 3 and Oconee implementing documents. These issues have been documented in the corrective action program for evaluation and appropriate changes to the implementing documents will be made, as required.

OE example 1 provides objective evidence that the existing AMPs and activities related to the *Open-Cycle Cooling Water System* AMP are being effectively implemented to manage aging effects of in scope raw water system piping and components. This example also demonstrates that effectiveness reviews of AMPs are appropriately used to recognize and correct potential gaps in AMP implementation and identify areas for improvement.

2. In 2003, a comprehensive study was performed to address the risk of potential leakage of non-isolable portions of the low pressure service water system within the reactor building due to the extended plant operating life of 60 years. This study involved development of an internal corrosion model to predict the number of expected system leaks within the Unit 1 reactor building through the end of the PEO and predict when they will occur. The Unit 1 results are representative of all three units based on the similarity of Unit 1, 2, and 3 systems. The internal corrosion model estimated the probability of leakage attributable to general or localized corrosion based on OE, piping design, flow conditions, water chemistry, and operating temperatures. Although no leaks had occurred to date, the results of this study indicated that leakage from carbon steel low pressure service water system piping four-inch diameter or less was expected prior to the end of the first PEO.

Based on the results of this study, a long range plan was developed to pro-actively replace carbon steel low pressure service water system piping, four-inch diameter or less, located within the reactor building, prior to the development of through wall leaks which could require an emergent maintenance outage for repair. The plan includes replacement of piping to and from the reactor coolant pump motor coolers with upgraded stainless steel piping and like-for-like replacement of the piping to and from the reactor building auxiliary coolers. Replacement of the reactor building auxiliary cooler piping with stainless steel could not be performed due the higher coefficient of thermal expansion of stainless steel as compared to carbon steel which would lead to increased loading of piping supports at the piping design temperature.

This project includes the replacement of over a total of over 2000 linear feet of piping. As of September 2020, approximately 875 linear feet of piping has been replaced. The remaining piping replacements are scheduled to occur during upcoming refueling outages. There have been no through wall leaks in the remaining original piping that is scheduled for replacement.

OE example 2 provides objective evidence that the *Open-Cycle Cooling Water System* AMP takes proactive action to address long term aging concerns prior to loss of intended function.

3. The *Open-Cycle Cooling Water System* AMP includes annual monitoring for the presence of Asiatic clams at 38 locations throughout raw water systems at Oconee. Sample locations include various hydrants, pumps, and heat exchangers supplied by raw water from Lake Keowee. Asiatic clams are detected by flushing water through a filter screen which collects any clams present in the sample. Once collected the number and volume of clams is recorded for trending. For each sample location, the acceptance criteria are less than or equal to 30 total clams and less than or equal to a one-half cup volume of clams.

   A review of sampling data has been performed for years 2011 through 2020. Over 600 samples were collected to detect the presence of Asiatic clams within raw water systems over that ten year period. Over that time period, no sample results exceeded acceptance criteria. The sample results do not indicate any increasing trend in the number or volume of Asiatic clams present in samples and most samples identified zero clams.

   In addition, long term monitoring of Lake Keowee is performed to determine changes in Asiatic clam populations and detect the presence of other invasive species, such as zebra mussels. This includes monitoring Asiatic clam population density each refueling outage for all three units. During each outage, twelve samples are collected in total at the intake structure. For each of the four condenser circulating water pumps: one is taken on the lake side of the intake screens, one on the plant side of the intake screens, and one from the pump pits. The most recent sampling results, through the Unit 3 2020 spring refueling outage, show Asiatic clam populations consistent with previous monitoring years.

   The results of both system and lake monitoring are periodically reviewed and evaluated for changes that could adversely impact the potential flow blockage. This review is documented in a station calculation. As of the most recent update of this calculation in 2019, the review concluded that there is no indication of changes in Asiatic clam populations, presence of hydrilla, or introduction of zebra mussels.

OE example 3 provides objective evidence indicating that the potential for flow blockage due to macro-biological fouling does not exist for raw water systems within the scope of this program. In addition, the OE demonstrates that sufficient sampling is performed such that if populations of Asiatic clams increase or the introduction of new invasive species occurs, then the program will be able to detect these changes and take appropriate corrective actions prior to impact on system intended functions.

4. A review of Oconee OE over a 10-year period (January 2011 through January 2021) has revealed recurring internal corrosion in steel piping exposed to raw water from Lake Keowee. Through wall leakage due to localized piping degradation have occurred on several occasions. Generally, leaks have occurred in stagnant or intermittent flow locations. For leaks where metallurgical lab or biological lab analysis has been performed, the cause of leakage has been attributed to pitting and galvanic corrosion with microbiologically influenced corrosion identified as a contributor or potential contributor in some instances. When leakage has been identified, the issue has been entered into the corrective action program and appropriate corrective actions have been taken including increased inspections, piping repair or replacement, and modifications to install more corrosion resistant piping materials.

   In addition, there have been several occasions over the ten year review period where wall thickness measurements have identified remaining wall thickness less than pre-established screening criteria or less than 50 percent of nominal wall thickness. General corrosion rates at Oconee are typically on the order of one to two mil per year due to the high quality of raw water from Lake Keowee. Challenges to required minimum wall thickness are normally due to localized corrosion. The specific corrosion mechanism cannot be definitively established through wall-thickness measurements and so are conservatively assumed to be indicative of recurring internal corrosion as defined in Section 3.3.2.2.7 of NUREG-2192. When wall-thickness below conservative screening criteria has been identified, the issue has been entered into the corrective action program and appropriate corrective actions have been taken including reevaluation of required minimum wall thickness, piping repair or replacement, and modifications to install more corrosion resistant piping materials.

   The existing *Open-Cycle Cooling Water System* AMP relies on periodic wall-thickness measurements to monitor the condition of raw water system piping. The number and locations of inspections are determined based on susceptibility to corrosion and consequence of failure. Currently, there is no minimum required number of periodic wall thickness measurements. However, the program will be enhanced to require a minimum of 20 wall thickness measurements every 24 months until the rate of recurring internal corrosion occurrences no longer meets the criteria for recurring internal corrosion as defined in Section 3.3.2.2.7 of NUREG-2192. The selected inspection locations will be periodically reviewed to validate their relevance and usefulness and adjusted as appropriate. Evaluation of the inspection results will include (1) a comparison to the nominal wall thickness or previous wall thickness measurements to determine rate of corrosion degradation; (2) a comparison to the design minimum allowable wall thickness to determine the acceptability of the component for continued use; and (3) a determination of re-inspection interval.

OE example 4 provides objective evidence that plant OE is reviewed and evaluated for indications of recurring internal corrosion and appropriate corrective actions are taken to ensure aging is adequately managed.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Open-Cycle Cooling Water System* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation, or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Open-Cycle Cooling Water System* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Open-Cycle Cooling Water System* AMP, with the enhancements noted above, will provide reasonable assurance that the identified aging effects will be adequately managed such that intended functions of components within the scope of LR are maintained consistent with the CLB during the SPEO.

B2.1.12 CLOSED TREATED WATER SYSTEM

Program Description

The *Closed Treated Water Systems* program is an existing program that manages the aging effects of cracking, loss of material and reduction in heat transfer. The program consists of: a) water treatment, including use of corrosion inhibitors, to modify the chemical composition of the water such that the effects of corrosion are minimized, b) chemical testing to ensure water treatment maintains water chemistry within acceptable guidelines, and c) inspections to determine the presence or extent of degradation. The program includes coupon testing to measure corrosion rates and microbiological testing. The program uses the guidance in EPRI Report 3002000590, "*Closed Cooling Water Chemistry Guideline*", as applicable.

Systems and components managed by the *Closed Treated Water Systems* program include: alternate chilled water system, chilled water (vital loads) system, chilled water (non-vital loads) system, component cooling system, recirculating cooling water system, the standby shutdown facility diesel jacket water cooling system, and systems that interface with these systems.

The *Closed Treated Water Systems* program is implemented through procedures. The program utilizes a molybdate-based water treatment program to mitigate the effects of aging of components exposed to a closed treated water environment. Water sample analysis is performed periodically to ensure water chemistry parameters are maintained within limits specified in procedures and which are based on guidelines in EPRI Report 3002000590. Monitoring of chemistry parameters also ensures that contaminants are maintained below limits to minimize corrosion. Periodic and opportunistic visual inspections to monitor the condition of components are performed whenever the system boundaries are opened. A representative sample of components is selected based on the likelihood of loss of material, cracking, or reduction of heat transfer in each ten year period during the SPEO. At a minimum, a representative sample of 20% of the population (defined as components having the same material, water treatment program and aging effect combination) or a maximum of 17 components per population for each unit will be inspected. At least 20% of the surface area will be inspected for each component. For components measured in linear feet, such as piping, inspection of one foot axial length section is equivalent to one component inspection. Any combination of components or one foot sections of piping can be counted towards the representative sample size.

When the sample size is not based on the percentage of the population, the total number of inspections may be reduced to seventeen components per population for each unit at three-unit sites such as Oconee. This is acceptable because design, operating, and environmental conditions between the units are similar enough such that the aging effects are not occurring differently. All three units are of comparable age, and changes to water chemistry practices, operating conditions, etc., have been implemented in a consistent manner across all three units. A measurement uncertainty recapture power uprate license amendment request was approved by the NRC in January 2021 (ADAMS Accession Number ML20335A001). Implementation of the measurement uncertainty recapture power uprate will not substantively change operating conditions such that the rate of aging effects managed by this program would be affected. No other power uprates have been implemented on any of the Oconee Units. Water chemistry programs monitor various chemistry parameters and require out-of-spec conditions to be corrected under the corrective action program in a timely manner. Oconee has only one standby shutdown facility diesel generator, such that distribution of diesel generator run times is not an issue. Therefore, a reduced maximum sample population size will provide a representative sample of the condition of the plant equipment and the existence of the aging effects involved.

Inspections focus on the bounding or lead components most susceptible to aging due to time in service and severity of operating conditions.

Heat transfer capability of heat exchanger surfaces will be evaluated by either visual inspections to determine surface cleanliness or function testing to verify that design heat removal rates are maintained.

If any inspections do not meet the acceptance criteria, additional inspections will be conducted, unless the cause of the aging effect for the applicable material and environment combination is corrected by repair or replacement. There will be no fewer than five additional inspections for each inspection that does not meet the acceptance criteria or 20% of the applicable material, environment and aging effect combination is inspected, whichever is less. If any subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause analysis will be conducted to determine the further extent of inspections. Additional samples will be inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. The additional inspections will be completed within the interval (e.g., refueling outage interval, 10-year inspection interval) in which the original inspection was conducted.

The additional inspections will include inspections of components for the same material, environment, and aging effect combination from all three units. The additional inspections will be conducted within the interval (e.g., refueling outage interval, ten year inspection interval) in which the original inspection is conducted. Inspections and tests will be performed by personnel qualified in accordance with site procedures and programs to perform the specified task. Inspections within the scope of ASME Code will follow procedures consistent with the ASME Code. Non-ASME Code inspection procedures will include guidance for items such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes.

NUREG-2191 Consistency

The Oconee *Closed Treated Water Systems* AMP is an existing program that will be consistent with the ten elements of AMP XI.M21A, "*Closed Treated Water Systems*" specified in NUREG-2191 (GALL-SLR), as modified by SLR-ISG-2021-02-MECHANICAL, "*Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance*," with enhancements described below.

Exception to NUREG-2191

None

Enhancements

The following enhancement(s) will be implemented in the following program element(s): Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), Corrective Actions (Element 7)

1. Perform condition monitoring using techniques (visual, surface, or volumetric) capable of detecting loss of material, cracking, and fouling as appropriate. Perform visual inspections for loss of material and fouling whenever the system boundaries of the closed treated water systems are opened. Perform surface or volumetric examinations when susceptible materials are inspected for cracking (Elements 3 and 4).

2. In each ten year period during the SPEO, perform sufficient number of inspections to ensure that the minimum representative sample of 20% of the population up to 17 inspections per unit is met. A population is defined as components having the same material, water treatment program and aging effect combination. Perform inspections on those components that are more likely to be susceptible to aging based on time in service and severity of operating conditions (Element 4).

3. Perform additional inspections when inspections do not meet acceptance criteria. Perform at least 5 additional inspections for every inspection not meeting acceptance criteria or 20% of each applicable material, environment, and aging effect combination, whichever is less (Elements 4 and 7).

4. Provide additional guidance in procedures for inspections of non-ASME Code components for items such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes (Element 4).

5. Where practical, project the rate of any degradation until the next scheduled inspection or the end of the SPEO (whichever is shorter). Adjust the sampling bases (e.g., selection, size, frequency) as necessary based on the projections (Element 5).

6. If subsequent inspections identify aging effects, the corrective action program will be used to determine the extent of condition and extent of cause to determine the further extent of inspections. Perform additional inspections on all units with the same material, environment, and aging effect combinations and within the interval of the original inspection (e.g., refueling outage interval, ten year inspection interval). (Element 7).

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Closed Treated Water Systems* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In 2013 and 2014, corrosion rate measurements from coupon testing were performed for the Component Cooling Water, Recirculating Cooling Water, Chilled Water (Vital Loads), and Chilled Water (Non-Vital Loads). Results from these tests showed very low corrosion rates in these systems as summarized below:

   - The Units 1, 2, and 3 Component Cooling System showed no measurable corrosion response for copper, brass, carbon steel, and stainless steels. Cast iron coupons were the only material to show a corrosion response with corrosion rate on all three units well below 0.3 mil/yr. Corrosion rates below 0.3 mil/yr are considered to be in the "good" category (i.e., lowest corrosion rate category) as defined in EPRI Report 3002000590 Table 8-1.
   - The Unit 1/2 and Unit 3 Recirculating Cooling Water System showed no measurable corrosion response for stainless steel and admiralty brass. Steels were the only material to exhibit a detectable corrosion rate, with corrosion rates well below 0.3 mil/yr.
   - The Chilled Water (Vital Loads) and Chilled Water (Non-Vital Loads) showed no measurable corrosion response for steel and copper.

   OE example 1 demonstrates that corrosion rate monitoring of closed treated water systems is being performed in accordance with industry guidelines and that corrosion coupon surveillances are effective in monitoring effectiveness of water treatment programs and identifying aging effects prior to loss of intended function.

2. In 2014, pH in the A and B standby shutdown facility diesel jacket water cooling system was found out of specification below the action level 1 limit of 9.0. In accordance with chemistry procedures, caustic chemical addition was performed to bring pH back into specification. The cause of the decrease in pH was attributed to an engine coolant addition following an annual standby shutdown facility diesel outage. During this outage, the entire diesel jacket water inventory was drained and replaced with newly mixed coolant. Following the completion of the diesel outage, a performance test of the standby shutdown facility diesel was completed, and the standby shutdown facility Diesel Jacket Water Cooling System was sampled for total iron and total copper only. Further investigations determined that work instructions and chemistry procedures did not provide sufficient guidance as to the parameters that were to be sampled following the post maintenance run. The standby shutdown facility diesel jacket water cooling system was not sampled again until 22 days after the outage, resulting in the control parameter remaining out of specification for an extended period of time.

   The possibility that the coolant was diluted following the coolant addition was ruled out as no demineralized water additions were performed, thus leading to the conclusion that insufficient quantity of sodium hydroxide was added during the coolant premixing to raise the pH within specification. Coolant is premixed in drums for the addition to the standby shutdown facility diesel jacket water cooling system. The procedure for premixing the coolant did not provide instructions on the quantity of sodium hydroxide to be added or to verify afterwards that pH and other chemistry parameters were within specification.

   A contributing cause was determined to be the lack of qualified personnel to perform the sampling task during times when the standby shutdown facility diesels were running.

Standby shutdown facility diesel runs are normally conducted during weekends and backshifts, periods when qualified resources were not available to conduct sampling.

Resulting corrective actions were initiated to: 1) revise procedures to require a post-chemical addition sampling/analysis within a specified period of time to verify that chemical additions adjusted chemistry as desired, and 2) ensure sampling and analysis of the standby shutdown facility diesel jacket water cooling system is performed while running and appropriate personnel qualified to the task are available.

OE example 2 provides objective evidence that the water treatment program effectively monitors in scope treated water systems to assure that water treatment program processes and specifications are maintained and adjusted as necessary. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and to implement corrective actions to improve program performance.

3. In 2016, a data review identified a long-term trend of increasing copper and ammonia in the Unit 1/2 and Unit 3 recirculating cooling water system. The trend indicated copper was increasing in parallel with ammonia. The cause of increasing ammonia in the recirculating cooling water system, as well as in other closed treated water systems, is suspected to be produced from bacteria under a sludge or slime layer that is not detectable using the typical biological growth detection technique. Investigations concluded that the cause of the increasing ammonia was not due to leakage from a secondary system source. The best option for the treatment for increasing ammonia is to add glutaraldehyde (H-550). Glutaraldehyde is a biocide that controls microbiological growth and reacts with and removes ammonia present in the bulk water above the sludge/slime layers. The increasing ammonia trend was corrected for the recirculating cooling water system following the biocide addition.

   OE example 3 provides objective evidence that the program manager critically self-assesses program performance and self-identifies actions that support continuous improvement. This example also demonstrates the effective use of the corrective action program and industry OE to take timely and effective corrective actions to correct deficiencies that could adversely affect closed treated water system intended functions during the SPEO.

4. In August 2020, an AMP effectiveness review of license renewal aging management activities was performed, which included a detailed review of select AMPs and commitments. Although the *Closed Treated Water Systems* program is not an aging management program identified in UFSAR Chapter 18, the program encompasses programs and aging management activities developed for the first license renewal. These Chapter 18 programs and aging management activities include: *Chemistry Control* program (UFSAR Section 18.3.2) and the *Jacket Water Heat Exchanger* preventive maintenance activity (UFSAR Section 18.3.17.9). The AMP and preventive maintenance activity were evaluated against the performance criteria identified in NEI 14-12, “Aging Management Program Effectiveness.” The review concluded that the *Chemistry Control* program and *Jacket Water Heat Exchanger* preventive maintenance activity are meeting the requirements of NEI 14-12. No gaps were identified by the effectiveness review.

This effectiveness review provides objective evidence that current programs and activities encompassed by the *Closed Treated Water Systems* program are effectively managing aging and meeting all current LR commitments. This provides reasonable assurance that ongoing program effectiveness will continue in the SPEO.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Closed Treated Water Systems* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Closed Treated Water System* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Closed Treated Water Systems* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.13 INSPECTION OF OVERHEAD HEAVY LOAD AND LIGHT LOAD (RELATED TO REFUELING) HANDLING SYSTEMS

Program Description

The *Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* AMP is an existing monitoring program that provides for periodic visual inspections of cranes and hoists in the scope of 10 CFR 54.4. The program includes structural components that make up the bridge, the trolley, the rail system, structural bolting, and lifting devices, and includes cranes and hoists that meet the provisions of NUREG-0612, "*Control of Heavy Loads at Nuclear Power Plants*." These cranes must also comply with the maintenance rule requirements provided in 10 CFR 50.65.

The AMP includes periodic visual inspections to detect degradation of bridge, rail, and trolley structural components and bolted connections. The program relies on the guidance in NUREG-0612, ASME B30.2, "*Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)*," and other appropriate standards in the ASME/ANSI B30 series to manage aging. The inspection frequency for cranes is based on the guidance provided by ASME B30.2. The inspection frequency for hoists is based on guidance provided by ASME B30.16, "*Overhead Underhung and Stationary Hoists*."

NUREG-2191 Consistency

The *Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* AMP is an existing program that will be consistent with the ten elements of AMP XI.M23, *"Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems,"* specified in NUREG-2191 (GALL-SLR) with enhancements as described below.

Exception to NUREG-2191

None

Enhancements

The following enhancements will be implemented in the following program elements: Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4), Acceptance Criteria (Element 6), and Corrective Actions (Element 7)

1. Provide additional procedural guidance to include visual inspections looking for deformation and cracking of bridges, structural members, and structural components (Elements 3, 4 and 6).

2. Provide additional procedural guidance to specify bolted connections are monitored for loss of material, cracking, loose or missing bolts or nuts, and other conditions indicative of loss of preload (Elements 3, 4 and 6).

3. Include evaluation of findings according to ASME B30.2 or other applicable ASME B30 series in applicable procedures (Element 6).

4. Enhance maintenance procedures to ensure repairs are performed in accordance with manufacturers literature and ASME B30.2 or other applicable ASME B30 series (Element 7).

<u>Operating Experience</u>

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. It was identified in 2015 that the Polar Crane inspections were not being performed in accordance with ASME B30.17. There were two visual inspections scheduled in the work management system associated with the polar crane; one for the periodic maintenance set to a 2 year frequency (on a refueling outage basis), and one to perform the structural steel inspections set on a 6 year frequency. ASME B30.17 requires such inspections be performed each outage, prior to use. A condition report was initiated in the corrective action program and corrective actions implemented to revise the applicable maintenance procedure and work management system activity schedule to require Polar Crane structural steel inspections each outage (prior to use).

   OE example 1 provides objective evidence that the program manager critically self-assesses program performance, identifies deficiencies and initiates appropriate corrective actions to evaluate and correct deficiencies using the corrective action program.

2. Maintenance technicians identified corrosion/rust on the Keowee intake crane structure during a 2017 visual inspection. Engineering evaluated the corrosion and noted the corrosion was primarily at the welded seams at the diamond plate decking and a result of constant exposure to the elements/humid/wet environment. There was no significant metal loss and the crane was deemed fully operable. A work request was generated in the work management system to strip the area of corrosion and recoat.

   The *Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* program inspections are effective in identifying aging effects prior to loss of intended function. OE example 2 also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and to monitor and trend the conditions.

3. In September 2020, an aging management program effectiveness review was performed on the *Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* program. The *Overhead Heavy Load and Light Load (Related to Refueling) Handling*

Systems program was evaluated against the performance criteria identified in NEI 14-12 “Aging Management Program Effectiveness.” The review concluded that the *Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* program is meeting the requirements of NEI 14-12. No gaps were identified during the effectiveness review. This effectiveness review provides objective evidence that the current *Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* program is effectively managing aging and meeting all current license renewal commitments. This provides reasonable assurance that ongoing program effectiveness will continue in the subsequent period of operation.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Periodic assessments of the *Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.14 COMPRESSED AIR MONITORING

Program Description

The *Compressed Air Monitoring* AMP is an existing preventive and condition monitoring program that manages loss of material downstream of the instrument air dryers. The program provides reasonable assurance of the integrity of instrument air system components exposed to a dry air environment. Program activities include air quality checks at various locations to ensure that moisture (water), particulates, and hydrocarbons (oil) are maintained within the specified limits. The program also includes performance of opportunistic inspections of the internal surfaces of select compressed air system components for signs of loss of material due to corrosion. The program manages loss of material in carbon steel, stainless steel, galvanized steel, copper alloy, and copper alloy (>15% Zn) piping, piping components, valve bodies, tanks and filter housings in an air-dry internal environment.

The AMP is based on the Oconee responses to NRC GL 88-14, *"Instrument Air Supply Problems"* and INPOs SOER 88-01, *"Instrument Air System Failures"*. The program also incorporates the air quality provisions provided in EPRI's *Compressed Air System Maintenance Guide* (Report 1006677) and ANSI/ISA-7.0.01-1996, *Instrument Society of America Quality Standard for Instrument Air.* The program is informed by guidance in the American Society of Mechanical Engineers (ASME) operations and maintenance standards and guides (ASME OM-2012, Division 2, Part 28).

The *Compressed Air Monitoring* AMP credits periodic tests and preventive maintenance inspections of compressed air system components to detect the effects of corrosion and presence of contaminants. The program ensures that air quality test data is reviewed and compared to test acceptance criteria to determine if limits have been exceeded. Air quality analysis results are checked for unusual trends. Test data are analyzed and compared to data from previous tests to provide for the timely detection of aging effects on passive components. Opportunistic visual inspections of accessible internal surfaces will be performed to identify signs of corrosion and abnormal corrosion products that might indicate a loss of material within the system. Results from inspections are compared with established acceptance criteria to provide for timely detection of aging effects. Monitoring methods are effective in detecting the applicable aging effects, and the frequency of monitoring is adequate to prevent significant age-related degradation. Tests and inspections provide assurance that systems and components within the scope of the program continue to perform their intended function.

Deficiencies are documented in the corrective action program and evaluations are performed for test or inspection results that do not satisfy established criteria. The corrective action program ensures that conditions adverse to quality are promptly corrected. The corrective action program is implemented in accordance with the requirements of the 10 CFR Part 50, Appendix B quality assurance program.

NUREG-2191 Consistency

The *Compressed Air Monitoring* AMP is an existing program that will be consistent with the ten elements of AMP XI.M24, *"Compressed Air Monitoring"* specified in NUREG-2191 (GALL-SLR) with enhancements described below.

Exception to NUREG-2191

None

Enhancements

The following enhancements will be implemented in the following program elements: Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), Acceptance Criteria (Element 6) and Corrective Action (Element 7):

1. Perform opportunistic visual inspections of select component internal surfaces exposed to a dry air environment for signs of loss of material due to corrosion. Inspections will be performed by station personnel who have been qualified to the task per approved training procedures and programs. Acceptance criteria will ensure that internal surfaces that show signs of corrosion, that could indicate the potential loss of function of the component, are identified. The program will require corrective actions to be taken if loss of material due to corrosion is identified on internal surfaces of components. (Elements 4, 5, 6, and 7)

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Compressed Air Monitoring* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. As part of the current *Compressed Air Monitoring* AMP, the primary instrument air system quality test is used to monitor for oil content. At one time, little or no oil was generally detected in the system air samples. At an industry users group meeting in 2011, another utility shared that test equipment used to accomplish air quality sampling may not be suited for detecting synthetic oil. Synthetic oil was used in the system compressors at Oconee. The Oconee program manager validated the information with the test equipment vendor and a condition report was initiated in the corrective action program to document the situation. The information was also shared with the nuclear industry.

   Ultimately, the oil sampling method was changed to meet the requirements of ANSI CGAG-7.1-2004 and as noted in EPRI *Compressed Air System Maintenance Guide*, (1006677). Use of the revised sample method resulted in oil samples results ranging from 0.017 to 0.79 ppm. This method required a revision to the test acceptance criteria to align with the ANSI Standard of <1 ppm.

   OE example 1 provides objective evidence that the program manager critically self-assesses program performance and self-identifies actions that support continuous improvement. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality.

2. In December 2013, a corrective action was initiated requesting that the Oconee compressed air monitoring program owner compare existing instrument air quality guidance to revised INPO Significant OE Report (SOER) 88-1 recommendations and to make changes as necessary. The compressed air monitoring program owner performed the review and instituted several program changes. The frequency of monitoring of system dew point was increased from once per day to once per shift. In addition, the basis for the frequency of air quality testing was reviewed and confirmed. Improved test methods were also evaluated. Results of the instrument air quality guidance comparison to the revised INPO SOER 88-1 recommendations were documented in the corrective action program.

   OE example 2 provides objective evidence that industry OE that involves aging is evaluated and used to adjust the program as necessary.

3. In November of 2016, an operator on turbine building rounds identified that the B primary instrument air system dryer had *"High Dew Point"* and *"Fail to Shift"* alarm status. A -24^{o}F high dew point condition prompted an automatic swap from the in stream right desiccant tower to the left desiccant tower which resulted in the "Fail to Shift" alarm. As a result, the primary instrument air compressor was shut down and a condition report and a work request were written.

   Maintenance and engineering personnel inspected the dryer and concluded that a dryer valve was not closing as expected. The valve was disassembled, and it was discovered that the lower disc nut had backed off and allowed the disc to dislodge from the stem. The valve was successfully reassembled with replacement parts. The valve procedure was changed to require a higher strength thread sealant to be used on the disc nut.

   OE example 3 provides objective evidence that the existing AMP activities are being effectively implemented to identify and manage aging effects of in scope components and that the results of inspection activities are used to inform and enhance the program. Deficiencies identified during inspection activities are entered into the corrective action program and appropriate actions are taken to evaluate and correct deficiencies.

4. In May of 2019, performance of the primary instrument air system quality test resulted in the acceptance criteria for particulate concentration not being met. The sample taken at the primary instrument air filter A location produced particles that were ten microns in size which exceeded the one micron criteria specified in the procedure. As a result, a condition report and a work request were written. The work request noted that the test results did not create an operational concern as critical systems are equipped with air filtration capability of five microns or smaller.

   Subsequent evaluation by engineering concluded that the sample tubing was not adequately purged prior to taking the sample. The inadequate purge was deemed to be the result of a training deficiency that resulted from the turnover of performance of the test from one organization to another. A training request form was submitted to address the training issue. The primary instrument air system quality test was re-performed with an adequate purge of the sample tubing with acceptable results.

OE example 4 provides objective evidence that the existing AMP activities are being effectively implemented to identify and manage aging effects of in scope components and that the results of inspection activities are used to inform and enhance the program. Deficiencies identified during inspection activities are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct the deficiencies.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Compressed Air Monitoring* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Compressed Air Monitoring* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Compressed Air Monitoring* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.15 FIRE PROTECTION

Program Description

The *Fire Protection* AMP is an existing condition and performance monitoring program that manages the identified aging effects for the fire barriers and the standby shutdown facility fire protection CO_2 system and associated components through the use of periodic inspections and functional testing to detect aging effects prior to loss of intended functions. System tests and inspections are performed by qualified personnel in accordance with guidance from NFPA Codes and Standards. The program applies to piping, piping components, and fire barriers (doors and dampers, penetration seals, walls, and slabs). Fire Protection component materials include carbon steel, galvanized steel, stainless steel, concrete, concrete block, grout, fireproofing materials, and elastomers.

The *Fire Protection* program monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant degradation. The program utilizes visual inspections of fire barrier penetration seals for signs of degradation such as cracking/shrinking, wear, seal separation from walls and components, and punctures, through periodic inspection. The program specifies visual examinations of the fire barrier walls, ceilings, and floors in structures within the scope of LR for signs of degradation such as loss of material and cracking/spalling. Periodic visual inspections are used to manage the aging effects of fire doors and fire damper assemblies. Fire doors are functionally tested. Inspection and testing frequencies are consistent with Oconee Selected Licensee Commitments. These inspections and tests are implemented through station procedures and recurring task work orders. Unacceptable conditions are entered into the corrective action program for proper disposition.

The program includes functional testing of standby shutdown facility fire protection CO_2 system components. The program also provides for aging management of external surfaces of the standby shutdown facility fire protection CO_2 system components that are within the scope of LR through periodic visual inspections for corrosion that may lead to loss of material.

NUREG-2191 Consistency

The Oconee *Fire Protection* AMP is an existing program that will be consistent with the ten elements of AMP XI.M26, *"Fire Protection Program"* specified in NUREG-2191 (GALL-SLR) with enhancements, as described below.

Exception to NUREG-2191

None

Enhancements

The following enhancement(s) will be implemented in the respective program element(s): Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Acceptance Criteria (Element 6).

The *Fire Protection* AMP will be enhanced to perform periodic visual inspection every 18 months for identification of corrosion that may lead to loss of material on the external surfaces of the standby shutdown facility fire protection CO_2 system.

<u>Operating Experience</u>

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Fire Protection* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. A corrective action program entry was made in April 2009 to document a concern regarding air potentially coming through a fire barrier penetration in the Turbine Building. A follow-up inspection found that the spare 2 inch diameter pipe sleeve penetration had no penetrants and was filled with approximately 16 inches of Dow Corning silicon foam. The condition of the cell structure of the foam was found to be acceptable. Based on inspection, there was good compression between the foam and the surface of the pipe sleeve and there was very little depth to any delamination occurring between the sleeve and the foam material. The source of the air flow perceived to be coming through the penetration was a floor opening/gap that allows natural circulation of air from the Turbine Building basement to proceed up past the penetration. No further action was required.

2. A corrective action program entry was made in August 2009 to document a finding identified during routine fire barrier inspections per procedure. The inspection identified a fire barrier between the Turbine Building and East Penetration Room which was degraded as a result of a damming board, which forms a portions of the fire barrier, found to have fallen off. An impairment was entered, and a continuous fire watch was established. Repairs were completed on the same shift per instructions provided in the inspection procedure for repair and reinstallation of damming material.

3. A corrective action program entry was made in January 2015 to address a degraded seal found during maintenance inspections of a Unit 1 cable room door (a commercial fire door). A follow up inspection was performed and found a cracked and degraded threshold seal between the threshold and the bottom of the door. Due to the very small size of the threshold gap, an evaluation determined that the fire door, in the as found configuration, was fully capable of meeting required design functions. A work request was issued to repair the material condition of the seal.

4. A corrective action program entry was made in July of 2010 to document a condition that affected the crossover fire dampers in the Unit 1, Unit 2 and Unit 3 penetration rooms. The dampers were found to have paint on them that potentially interfered with their operation. The paint on all three units' dampers appeared to be from incidental paint brush strokes that were made while painting the penetration room walls. Selected

Licensee Commitment 16.9.5 B was entered for inoperable Oconee Unit 1, 2, and 3 fire dampers with no fire detection within 15 feet on only one side of the damper. Hourly fire tours were initiated per the Selected Licensee Commitment required actions, and fire impairments were implemented until corrective actions were completed. The paint was removed, and the dampers were restored to their normal configuration. As part of the corrective action, a test was written to demonstrate that the “gravity” drop fire dampers would function as required with paint in the damper tracks. The test confirmed that the dampers functioned as expected.

These examples demonstrate site awareness of *Fire Protection* AMP requirements and the need to maintain the operability of fire barriers. The OE also demonstrates the use of compensatory measures while fire protection deficiencies are corrected and reflects the ongoing use of the corrective action program to capture and resolve items that might be associated with deficiencies/degradation of credited fire barriers.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Fire Protection* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Fire Protection* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Fire Protection* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.16 FIRE WATER SYSTEM

Program Description

The *Fire Water System* AMP is an existing condition monitoring program that manages loss of material and flow blockage for water-based fire protection systems that consist of sprinklers, nozzles, valve bodies, fire pump casings, hydrants, hose stations, standpipes, aboveground and underground piping and piping components, strainers, and the elevated water storage tank. The program also manages loss of coating integrity of the internal coating of the elevated water storage tank. This program relies on flow testing, visual inspections, and volumetric examination to ensure that loss of material due to due to general, pitting and crevice corrosion, microbiologically influenced corrosion, or fouling, and flow blockage due to fouling is adequately managed.

The high pressure service water system is normally maintained at required operating pressure and is monitored such that loss of system pressure is detected. The Keowee fire detection/ protection system is normally charged by static head from Lake Keowee. System flow downstream of the Keowee fire pump is monitored such that leakage from a normally stagnant line would be detected. Monitoring of operating parameters of the high pressure service water system and Keowee fire detection/protection system ensure prompt corrective actions can be initiated if leakage occurs.

The system flow testing, visual inspections and volumetric inspections ensure that aging effects are managed such that the system intended functions are maintained. Flow testing results are reviewed and trended to identify degrading trends prior to loss of system function. Inspections and tests are performed by personnel qualified in accordance with station procedures and programs to perform the specified task. The program ensures that testing and inspection activities have been performed and documented. Abnormal results are entered into the corrective action program for review and resolution.

The *Fire Water System* program will include testing of a representative sample of the sprinklers prior to fifty years in service consistent with the 2011 Edition of NFPA 25, *"Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems,"* Section 5.3.1. Performance of the initial 50-year tests will be determined based on the date of the sprinkler system installation.

Portions of water-based fire protection system components that have been wetted but are normally maintained dry were designed and installed with a configuration and pitch to allow draining. Walkdowns and review of design documents have been performed to verify proper draining of dry pre-action sprinkler systems and deluge systems. Station procedures for these systems include guidance to remove drain plugs and open drain valves to ensure systems are fully drained following actuation. Therefore, augmented testing in addition to that specified in NFPA 25 is not required.

Age-related degradation of the external surfaces of underground fire main piping is managed by the *Buried and Underground Piping and Tanks* (B2.1.26) AMP. Age-related degradation of the internal surface of the cement-lined buried fire header is managed by the *Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (B2.1.27) AMP.

Acceptance criteria and corrective actions for the elevated water storage tank internal coating inspections are implemented by the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (B2.1.27) program.

Recurring internal corrosion of steel water-based fire suppression system piping exposed to raw water from Lake Keowee is managed by the *Open-Cycle Cooling Water System* (B2.1.11) program.

NUREG-2191 Consistency

The *Fire Water System* AMP is an existing program that will be consistent with the ten elements of AMP XI.M27, "*Fire Water System,"* specified in NUREG-2191 with the exceptions and enhancements noted below.

Exception 1 to NUREG-2191

Program Element Affected: Detection of Aging Effects (Element 4)

1. NUREG 2191, Table XI.M27-1 recommends flow testing of the hydraulically most remote hose connection of each zone of the automatic standpipe system to verify the water supply can provide the design pressure at the required flow. The Oconee *Fire Water System* AMP will allow flow testing at hose connections other than the hydraulically most remote location.

   Justification for Exception 1

   As described in Section A.6.3.1.1 of NFPA 25, 2011 Edition, the hydraulically most remote hose stations are generally located at upper elevations. However, internal sediment and fouling is generally more prevalent at system low points. The program will allow for flow testing of hose stations at or near system low points where flow blockage due to fouling is most likely to occur. Testing of lower elevation hose stations also allows for additional flushing of the system piping most susceptible to accumulation of silt and debris such that the impact of fouling on system performance is mitigated. Further, Oconee fire suppression system design does not include a typical standpipe system where multiple hose stations on each floor are supplied through a single standpipe equipped with a control valve and alarm check valve. Instead, hose stations are supplied locally from the building header. The three-year flow test of the fire suppression system headers ensures that adequate water supply is available locally to hose stations throughout the station. If the hose station selected for testing is other than the hydraulically most remote, the acceptance criteria for the flow test will be set to account for the additional head loss that would be experienced if the hydraulically most remote hose station were tested such that the results of the flow test are representative of the limiting location.

Exception 2 to NUREG-2191

Program Element Affected: Detection of Aging Effects (Element 4)

2. NUREG 2191, Table XI.M27-1 recommends testing of deluge systems for which the nature of the equipment in the area being protected is such that water cannot be discharged in accordance with Section 10.3.4.3.1.1 of NFPA 25, 2011 Edition. The recommended deluge system test involves visual inspection to ensure that spray nozzles are correctly positioned and passing air through the spray nozzles to ensure that the nozzles are not obstructed. Visual inspections will be performed to verify spray nozzles are correctly positioned. Air discharge testing will not be performed for deluge systems at ONS that are not designed with connections to attach compressed air to the system which would allow for air flow testing.

   Justification for Exception 2

   Deluge systems that will not be tested in accordance with Section 10.3.4.3 of NFPA 25, 2011 Edition will be subject to alternative testing and inspection to ensure that the intent of the recommendations in NUREG 2191, Table XI.M27-1 is met. Each deluge system that is not air discharge tested is periodically trip tested every two years to verify the deluge valves operate as required. Periodic main drain testing will be performed at each deluge valve which will ensure that the flow path supplying water to the deluge system is not excessively fouled and will clear the line supplying the system of any accumulated debris. Significant age-related degradation is not expected of piping downstream of the deluge valve since the piping is maintained dry and has been verified to properly drain. Internal inspections have been performed at system low points where water accumulation could have occurred, and age-related degradation would be most likely. These inspections were performed after the systems had been in service for over 40 years and identified no signs of aging beyond minor surface rusting. The upstream and downstream piping attached to the deluge valve in each system will be internally inspected during periodic disassembly of the deluge valve performed every five years. Internal visual inspections will be performed to ensure branch lines supplying individual spray nozzles are not experiencing significant aging such as loss of material due to corrosion or flow blockage due to fouling. Internal visual inspections will be performed similar to those required by Section 14.2 of NFPA 25, 2011 Edition for sprinkler system branch lines that are likewise not able to be flow tested. Every five years a spray nozzle will be removed from one branch line in 50% of the deluge systems that are not flow tested to allow for internal visual inspection. The combination of testing and inspections will ensure that deluge systems that are not subject to discharge testing will be capable of providing adequate fire suppression capacity in the area being protected.

Exception 3 to NUREG-2191

Program Element Affected: Detection of Aging Effects (Element 4)

3. NUREG 2191, Table XI.M27-1 recommends periodic internal inspections of sprinkler system branch line piping consistent with Section 14.2 of NFPA 25, 2011 Edition.

Periodic internal inspections of the sprinkler system branch lines within the scope of the Oconee *Fire Water System* AMP will not be performed.

Justification for Exception 3

The only sprinkler systems within the scope of the *Fire Water System* AMP are the manually actuated dry pipe sprinkler systems providing fire suppression to the cable room, cable shaft level 3, and cable shaft level 4 & 5. Each of these systems is designed with two locked closed valves isolating the sprinkler system from the supply header. A tell-tale drain with a normally open drain valve is located at a system low point downstream of the two locked closed valves upstream of the riser supplying the sprinkler system spray header. The isolation valves are verified locked closed, the tell-tale drain valve is verified open, and the tell-tale is inspected for leakage monthly. These systems are not subject to periodic wetting as experienced by automatic dry pipe sprinkler systems during testing of the alarm check valve. A review of station OE has not identified any instances where these systems have been actuated. The sprinkler systems for the cable room, cable shaft level 3, and cable shaft level 4 and 5 are not subject to significant internal corrosion or flow blockage due to fouling since they are maintained dry and are not subject to periodic wetting during testing.

Enhancements

The following enhancements shall be implemented in the respective program elements:

Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), Acceptance Criteria (Element 6), and Corrective Actions (Element 7)

1. Perform internal visual inspections of deluge system piping by removing a hydraulically remote nozzle to identify internal corrosion, foreign material, and obstructions to flow. Internal visual inspections will be performed in 50 percent of the deluge systems within the scope of the *Fire Water System* AMP that are not subject to flow testing every five years. During the subsequent five year inspection period, the alternate systems will be inspected such that piping in 100 percent of the deluge systems within the scope of the program is inspected every ten years. Follow-up volumetric wall thickness examinations will be performed if internal visual inspections detect an unexpected level of degradation due to corrosion and corrosion product deposition.

2. Prior to fifty years in service, sprinkler heads will be submitted for field-service testing by a recognized testing laboratory consistent with NFPA 25, 2011 Edition, Section 5.3.1.

3. Perform a one-time volumetric wall thickness inspection on a representative sample deluge system supply piping that is periodically subjected to flow during functional testing.

4. Perform an obstruction investigation consistent with NFPA 25, 2011 Edition, Section 14.3 if evidence of unacceptable internal flow blockage that could result in failure of system

function is identified during internal inspections. When unacceptable internal flow blockage is detected, corrective actions will include removal of the material, an extent of condition determination, review for increased inspections, follow-up examinations, and a flush consistent with NFPA 25 Annex D.5, *Flushing Procedures*.

5. Revise inspection procedures to provide additional inspection guidance regarding age-related degradation and to include inspection parameters for items such as lighting, distance, offset, presence of protective coatings, and cleaning processes.

6. Perform flow testing of at least one hose station in each building every five years to demonstrate the capability to provide the design pressure at required flow. Flow testing will be performed at the hydraulically most remote hose station or, if an alternative hose station is tested, the acceptance criteria for the test will account for the additional head loss that would occur if the hydraulically most remote hose station were tested such that the results of the flow test are representative of the limiting location. If acceptance criteria are not met, at least two additional tests shall be performed within five years. If subsequent tests do not meet acceptance criteria, an extent of condition and extent of cause analysis is conducted to determine the further extent of tests. The additional tests include at least one test at one of the other units with the same material, environment, and aging effect combination.

7. Perform external visual inspections of the elevated water storage tank consistent with Section 9.2.5.5 of NFPA 25, 2011 Edition at least once every two years.

8. Perform flushing of the mainline strainers following system actuation consistent with Section 10.2.7 of NFPA 25, 2011 Edition.

9. Perform main drain testing of the deluge system risers at least once every two years. Main drain testing of deluge systems will be performed consistent with the procedure described Sections 13.2.5 and A.13.2.5 of NFPA 25, 2011 Edition. When there is a ten percent reduction in full flow pressure when compared to the original acceptance test or previously performed tests, the cause of the reduction shall be identified and corrected if necessary. If acceptance criteria are not met, at least two additional tests shall be performed within two years. If subsequent tests do not meet acceptance criteria, an extent of condition and extent of cause analysis is conducted to determine the further extent of tests. The additional tests include at least one test at one of the other units with the same material, environment, and aging effect combination.

10. Acceptance criteria and corrective actions for internal inspections of the elevated water storage tank will be in accordance with the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers and Tanks* program. Tank wall thickness measurements will be conducted if interior pitting or general corrosion (beyond minor surface rust) is detected.

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Fire Water System* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In August 2011 a pinhole leak was discovered on a section of four-inch high pressure service water system header piping on the first floor of the auxiliary building. When the segment of piping was removed during the repair in April 2012, significant corrosion and tuberculation was identified on the internal surface of the pipe. The removed segment of piping and a sample of the corrosion product was sent for laboratory analysis which indicated that microbiologically influenced corrosion contributed to the through wall leak. The corrosion product and tuberculation within the piping appeared to restrict the flow area by approximately fifty percent. Following discovery of the issue, an extent of condition review was performed. Given that the materials of construction, service life, and service conditions are similar throughout the high pressure service water system and in the Keowee fire detection/protection system, it was assumed that a similar buildup of corrosion products is possible throughout other portions of the water-based fire suppression systems. The supply headers in the turbine building are 16-inch or eight-inch. The supply header at the Keowee hydroelectric station is eight-inch. Since the supply headers in the turbine building and at the Keowee hydroelectric station are significantly larger than the auxiliary building headers, it was determined that the impact on the performance of fire suppression equipment in the auxiliary building due to flow restriction was bounding.

   A plan was developed to assess the functionality of the station water-based fire suppression system. The functionality assessment consisted of review of system design requirements, review of recent testing results, and performance of additional flow testing to verify the system remained capable of performing its design function. The 2012 performance of the triennial system flow test confirmed the auxiliary building high pressure service water system headers were able to provide flow in excess of their design requirement. A review of data from previous triennial flow tests showed no degrading trend in system performance.

   Additional flow testing was performed at seven hose stations located in the auxiliary building. At least one hose station was tested on each of the five auxiliary building main cross headers. Two hose stations were tested on the first floor where the issue was identified. The results of the flow tests showed that each of the hose stations were capable of providing flow at the rate and pressure required by design. The fire hose nozzles were inspected for debris following the hose station flow tests to address the potential of corrosion product breaking loose and blocking downstream nozzles or sprinkler heads. The nozzles used during the flow tests pass water through orifices smaller than the orifices in system sprinkler heads and spray nozzles. Several thousand gallons of water was passed through the fire hose nozzles during the flow tests and no clogging of the nozzles was observed during any of the tests. Debris that was collected in the nozzles during the flow tests was evaluated and determined to be small enough to pass through a sprinkler head or deluge system spray nozzle.

Based on the above, it was determined that the fire suppression equipment in the auxiliary building remained functional and capable of performing design functions. To ensure future reliability of the system, approximately 300 feet of four-inch header piping in the auxiliary building was replaced. The smaller diameter piping to hose stations supplied by this section of header piping was also replaced. Additional testing and inspections were performed to assess the extent of system piping experiencing similar degradation and the impact on system performance.

Internal visual inspections were performed to directly assess the condition of the internal surface of water-based fire suppression system piping. Internal inspections included a borescope inspection of the four-inch header, branch lines supplying individual hose stations, and a representative sample of small diameter piping in sprinkler and deluge systems through a removed sprinkler head or spray nozzle. The results of recently performed unrelated internal inspections of the deluge systems for the Unit 3 auxiliary and startup transformers and the Keowee hydroelectric station main transformer were also reviewed. Other than the auxiliary building four-inch header piping, internal inspections identified no excessive internal corrosion or fouling. Ultrasonic testing of the four-inch header in the vicinity of the through wall leak location showed adequate remaining wall thickness. A review of system flow testing data from 2012 through 2020 has been performed and did not identify any trend that would indicate performance degradation due to age-related degradation such as corrosion product buildup, fouling, or flow blockage.

OE example 1 provides objective evidence that degraded conditions are entered into the corrective action program and that appropriate actions are taken to assess the impact on system intended functions and perform repairs, as required, to ensure system intended functions are maintained.

2. In January 2012, the flow test of the Keowee fire detection/protection system failed to meet acceptance criteria due to insufficient flow. The flow test is performed by actuating the deluge system for the Keowee hydroelectric station main transformer which is the most demanding fire suppression system in the Keowee fire detection/protection system. Data recorded during the test indicated that the fire protection pump was operating as designed based on comparison of the discharge flow rate and total developed head to the pump curve. The main line strainer for the deluge system was inspected and the strainer and attached piping were found to be clean with no obstructions. Approximately fifteen feet of piping directly downstream of the deluge was inspected by borescope. No evidence of blockage or corrosion product buildup was identified. The fire protection pump was unavailable to perform an adequate system flush so instead, approximately 60 of the 68 nozzles in the system were removed, inspected, and cleaned. Two were found to be blocked and twelve were found to be unblocked but have some amount of corrosion product present. The flow test was reperformed following the cleaning and re-installation of the deluge nozzles. Three nozzles were found to be blocked during the test. The test did not meet acceptance criteria due to two adjacent nozzles being blocked.

Additional borescope inspections of the deluge system piping were performed including small diameter branch piping through removed nozzles and found the piping to be clean and free of significant corrosion. All of the three-inch and four-inch header piping and most of the vertical supply piping was inspected and minimal scaling was identified. Two sections of small diameter piping was conservatively replaced due to the presence of some flake-type material identified during borescope inspection. Multiple high velocity flushes of the system were performed by removing nozzles to ensure a high enough flow velocity was achieved during the flush to remove any loose corrosion product or debris.

Following the completion of the corrective actions described above, the system was successfully retested, and all acceptance criteria were met. Blockage of deluge nozzles has also been experienced in other transformer deluge systems. To address this issue, the procedures that direct the deluge system spray testing were revised to include guidance for performing high velocity flushes of the system to remove any accumulated corrosion product or foreign material. The revised procedures direct flow measurement during flushes to ensure that adequate flow velocity is achieved. If flow measurement is not performed, then the procedures require the removal of approximately one quarter of the system nozzles and several one inch or larger fittings at the direction of engineering.

OE example 2 provides objective evidence that system testing performed by the *Fire Water System* AMP is capable of detecting degraded system performance and that appropriate corrective actions are taken when degraded conditions are identified. OE example 2 also shows that program procedures are revised to include improved guidance when issues common to multiple water-based fire suppression systems are identified.

3. The high pressure service water system, including the buried fire header, is monitored for leakage by isolating the jockey pump so normal system loads are supplied by the elevated water storage tank and monitoring the drain down rate of the tank. This test has been performed annually since 2013. The results of the elevated water storage tank drain down test since 2013 have been reviewed. Following the 2015 drain down test, a condition report was generated to document a drain down rate significantly lower than experienced during previous tests. It was determined that the lower than expected drain down rate was due to the primary instrument air compressor being out of service. The high pressure service water system normally provides approximately 80 gallons per minute of cooling water to the primary instrument air compressor. Other than during the 2015 performance of the test, the measured drain down rate of the tank was as expected based on the normal system loads during each performance of the test which indicates that system leakage is not occurring.

   OE example 3 provides objective evidence that unusual or unexpected testing results are documented in the corrective action program such that changes in system operation or performance are appropriately evaluated.

4. A review of Oconee OE over a ten year period has revealed recurring internal corrosion in steel piping exposed to raw water within the scope of the *Fire Water System* AMP. Through wall leakage due to localized piping degradation have occurred on several occasions. When leakage has been identified, the issue has been entered into the corrective action program and appropriate corrective actions have been taken including

increased inspections, piping repair or replacement, and modifications to install more corrosion resistant piping materials.

In addition, there have been several occasions over the ten year review period where wall thickness measurements have identified remaining wall thickness less than preestablished screening criteria or less than 50% of nominal wall thickness. General corrosion rates at Oconee are typically on the order of one to two mil per year due to the high quality of raw water from Lake Keowee. Challenges to required minimum wall thickness are normally due to localized corrosion. The specific corrosion mechanism cannot be definitively established through wall-thickness measurements and so are conservatively assumed to be indicative of recurring internal corrosion as defined in Section 3.3.2.2.7 of NUREG-2192. When wall-thickness below conservative screening criteria has been identified, the issue has been entered into the corrective action program and appropriate corrective actions have been taken including reevaluation of required minimum wall thickness, piping repair or replacement, and modifications to install more corrosion resistant piping materials.

Recurring internal corrosion of water-based fire suppression system piping will be managed by the *Open-Cycle Cooling Water System* (B2.1.11) AMP. The material of construction and service environment are equivalent between the open-cycle cooling water systems and the water-based fire suppression systems and, therefore, managing recurring internal corrosion of these systems as a single population is appropriate. The *Open-Cycle Cooling Water System* (B2.1.11) program will inspect a representative sample of locations with conditions that are characteristic of the conditions found throughout raw water filled systems at Oconee. The results of these inspections are then extrapolated to similar locations throughout all the raw water systems within the scope of SLR. This characteristic-based approach recognizes the commonality among the component materials of construction and the environment to which they are exposed.

OE example 4 provides objective evidence that plant OE is reviewed and evaluated for indications of recurring internal corrosion and appropriate corrective actions are taken to ensure aging is adequately managed.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Fire Water System* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Fire Water System* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience.

Conclusion

The implementation of the *Fire Water System* AMP, with the noted enhancements above, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.17 OUTDOOR AND LARGE ATMOSPHERIC METALLIC STORAGE TANKS

Program Description

The *Outdoor and Large Atmospheric Metallic Storage Tanks* AMP is a new condition monitoring program that manages loss of material on the external surfaces of the Unit 1,2 and 3 borated water storage tanks and ensures there is no significant degradation of the tank bottoms. These are indoor large volume tanks that contain water and are designed with internal pressures approximating atmospheric that are sited on concrete. This program includes preventive measures to mitigate corrosion by protecting the external surfaces of the steel components in accordance with standard industry practices.

Oconee has no outdoor aboveground tanks constructed on concrete or soil, and no indoor tanks that sit on, or are embedded in, concrete where specific OE indicates that the tank surfaces are periodically exposed to moisture.

These tanks contain treated borated water, are constructed of carbon steel, are coated both internally and externally as a preventive measure to mitigate corrosion, and are supported on a concrete foundation, such that the bottoms of the tanks are inaccessible for direct visual inspection. Each borated water storage tank is surrounded by two external layers of metal siding that house fiberglass insulation in between. Between the tank surface and the inner metal siding there is a 6” air gap. Around the bottom portions of the tank in the air gap, there are two 1” thick Tempmat insulation blankets pressed against the tank surface. There is no sealant or caulking at the tank and concrete interface as the tank is located indoors.

This program manages loss of material by conducting periodic external surface visual inspections, and tank bottom volumetric inspections on a frequency of ten years or less. Cracking is not a predicted aging effect due to the carbon steel construction. These inspections ensure significant degradation is not occurring. The periodic inspection results are compared to the acceptance criteria to allow corrective actions to be taken prior to loss of intended function.

The *Outdoor and Large Atmospheric Metallic Storage Tanks* AMP does not manage loss of coating integrity for internal coating or linings. The activities to manage the aging effects for internal coatings or linings is managed by the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* (B2.1.27) AMP. The *Structures Monitoring* AMP (A2.33) will manage the tank concrete foundations and the borated water storage tank superstructures that serve as missile barriers.

The *Outdoor and Large Atmospheric Metallic Storage Tanks* AMP will perform the following activities:

- Conduct external tank surface inspections on a minimum of 20% of the tank on a ten year frequency.
- Conduct subsequent visual inspections every refueling outage. These inspections consist of a visual examination of the outer protective metal siding around the tank to identify indications of siding damage or water intrusion. If this inspection reveals new damage or water intrusion, then the shielding will be removed around that location to

ensure no damage to the tank has occurred. If no new damage is identified, then the inspection is complete.

- Perform a volumetric inspection of the borated water storage tank bottom, at least once every 10 years during the SPEO.

Non-ASME Code inspections are conducted in accordance with site procedures that include inspection parameters for items such as lighting, distance, offset, surface coverage.

<u>NUREG-2191 Consistency</u>

The *Outdoor and Large Atmospheric Metallic Storage Tanks* AMP will be consistent with the ten elements of AMP XI.M29, *"Outdoor and Large Atmospheric Metallic Storage Tanks"* specified in NUREG-2191.

<u>Exception to NUREG-2191</u>

None

<u>Enhancements</u>

None

<u>Operating Experience</u>

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the *Outdoor and Large Atmospheric Metallic Storage Tanks* AMP will be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO.

1. During a planned refueling outage in the fall of 2011 when the Unit 2 borated water storage tank was drained, a physical walkdown and visual inspection of the internal coating was performed. This inspection identified minor areas where the coating had blistered, but there was no indication of a through wall coating breach. A work order was generated to remove, inspect, and re-coat the area of concern. During this process, no loss of tank material was identified. The inspection determined that the internal coating was in good condition.

   OE example 1 demonstrates that inspections of the borated water storage tanks are being performed in accordance with industry guidelines and those inspections are effective in identifying aging effects prior to loss of intended function.

2. The Unit 3 borated water storage tank anchor bolts were visually inspected in the spring of 2014 to detect loss of material. To perform this visual inspection, two layers of metal siding and a layer of insulation were removed to expose the lower tank surface and the anchor bolts. During the inspection of the tank anchor bolts, visible areas of the tank exterior were also inspected. Minor corrosion, with no material loss was identified on the tank exterior. The areas on the tank exterior with minor corrosion were cleaned and re-

coated. Subsequently, preventive maintenance inspection activities were scheduled in the facility work management system to inspect the lower portion of each Unit 1, 2, and 3 borated water storage tank exterior for corrosion.

This example demonstrates that inspections of the borated water storage tanks are being performed in accordance with industry guidelines and that those inspections are effective in identifying aging effects prior to loss of intended function. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and to monitor and trend the conditions.

3. During a planned refueling outage in the Spring of 2016 when the Unit 3 borated water storage tank was drained, a physical walkdown and visual inspection of the interior of the tank was performed. The interior coating was inspected for loss of coating, flaking, or blistering, and the tank bottom was evaluated for loss of material by utilizing an ultrasonic testing machine. The evaluation report noted, small blisters in the coatings but no indication of a through coating breach was identified. Overall the condition of the coating was very good. Qualified personnel performed tank bottom thickness measurements across the entire bottom of the tank. All of the measurement readings were above nominal tank bottom thickness thresholds and no adverse loss of material trends were identified. The overall condition of the tank bottom was very good. There were no issues that were required to be resolved.

   This inspection confirms the tank interior and bottom are not degrading over time. OE example 3 demonstrates that inspections of the borated water storage tanks are being perform in accordance with industry guidelines and that those inspections are effective in identifying aging effects prior to loss of intended function.

4. During a planned refueling outage in the fall of 2016 when the Unit 1 borated water storage tank was drained, a physical walkdown and visual inspection of the interior of the tank was performed. The interior coating was inspected for loss of coating, flaking, or blistering, and the tank bottom was evaluated for loss of material by utilizing an ultrasonic testing machine. The evaluation report noted, small blisters in the coatings but no indication of a through coating breach was identified. The site coatings engineer determined the overall condition of the coating was very good. Qualified personnel performed tank bottom thickness measurements across the entire bottom of the tank. All of the measurement readings were above nominal tank bottom thickness thresholds and no adverse loss of material trends were identified. Overall the tank bottom was in very good condition and was recommended for continued service until the next scheduled inspection, currently every 3rd refueling outage. There were no issues that were required to be resolved. This inspection confirms the tank interior and bottom are not degrading over time.

   OE example 4 demonstrates that inspections of the borated water storage tanks are being performed in accordance with industry guidelines and that those inspections are effective in identifying aging effects prior to loss of intended function.

The above examples of OE provide objective evidence that the aging management activities and methods to be implemented by the *Outdoor and Large Atmospheric Metallic Storage Tanks* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *Outdoor and Large Atmospheric Metallic Storage Tanks* AMP will be performed to identify the areas that may need further improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Outdoor and Large Atmospheric Metallic Storage Tanks* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.18 FUEL OIL CHEMISTRY

Program Description

The *Fuel Oil Chemistry* AMP is an existing mitigative and condition monitoring program that relies on a combination of surveillance and maintenance procedures to manage loss of material from tanks, piping and components in a fuel oil environment and to maintain fuel oil quality. The program includes activities which provide assurance that contaminates are maintained at acceptable levels in fuel oil systems and components.

The fuel oil tanks within the scope of this program include:

- standby shutdown facility fuel oil storage tank
- standby shutdown facility fuel oil day tank

These fuel oil storage tanks do not have internal coatings. These fuel oil tanks are maintained by monitoring and controlling fuel oil contaminants in accordance with Technical Specification 5.5.14, Standby Shutdown Facility (SSF) Diesel Fuel Oil Testing Program and SR 3.10.1.8 Surveillance Requirement.

In accordance with the technical specifications, the acceptance criteria for each new fuel and stored fuel testing parameter has been established based on the following ASTM Standards:

- ASTM D2709 Standard Test Method for Water and Sediment in Middle Distillate Fuels by Centrifuge (fuel shipments, standby shutdown facility fuel oil storage tank, standby shutdown facility fuel oil day tank)
- ASTM D6217 Standard Test Method for Particulate Contamination in Middle Distillate Fuels by Laboratory Filtration (fuel shipments, standby shutdown facility fuel oil storage tank, standby shutdown facility fuel oil day tank)
- ASTM D4507 Standard Practice for Manual Sampling of Petroleum and Petroleum Products
- ASTM D975, Standard Specification for Diesel Fuel Oils.

The standby shutdown facility fuel oil storage tank and the standby shutdown facility fuel oil day tank are periodically drained of water and accumulated sediment, cleaned, and inspected on a 10 year frequency. Inspections will continue to be performed during the 10 year period prior to the SPEO and every ten years during the SPEO. The standby shutdown facility fuel oil storage tank is also monitored quarterly for the presence of water by draining oil from the bottom of the tank and the water is removed, if found. The activities effectively manage the effects of aging and maintain potentially harmful contaminants at low concentrations.

An approved biocide is added to all new fuel received at the site as a preventive measure. Samples of stored fuel are periodically evaluated for biological organisms and boron, which serves as an indication of biocide concentration. If necessary, additional biocide is added, for example, if concentration of the approved biocide in the fuel is low.

The One-Time Inspection (B2.1.20) program supplements this program by verifying the effectiveness of mitigative actions to ensure that degradation is not occurring and component intended functions are maintained during the SPEO.

NUREG-2191 Consistency

The Oconee *Fuel Oil Chemistry* AMP is an existing program that will be consistent with the ten elements of AMP XI.M30, "Fuel Oil Chemistry" specified in NUREG-2191 (GALL-SLR) with the enhancements noted below.

Exception to NUREG-2191

None

Enhancements

The following enhancements will be implemented in the following program element: Preventative Actions (Element 2), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), Acceptance Criteria (Element 6), and Corrective Actions (Element 7)

1. Monitor the standby shutdown facility fuel oil day tank quarterly for the presence of water by draining oil from the bottom of the tank and remove the water, if found. (Elements 2, 3 and 7)

2. Monitor the fuel oil stored in the standby shutdown facility fuel oil day tank quarterly for the presence of bacteria and fungus. (Elements 2, 3, 4, 5 and 6)

3. Perform volumetric wall thickness measurement of the standby shutdown facility fuel oil day tank if evidence of degradation is identified visually during the 10 year internal inspection. (Elements 3 and 4)

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Fuel Oil Chemistry* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In August 2012, pitting corrosion was identified on the ONS SSF Fuel Oil Storage Tank during a ten year 100% internal visual inspection of the tank. This tank is carbon steel with 0.375 inch nominal wall thickness and is externally coated but not internally lined. Following discovery of the pits, the entire internal surface of the tank, except for directly under the scaffold legs, was inspected by low frequency electromagnetic testing. One defect not previously observed during visual inspection was identified by low frequency

electromagnetic testing. Ultrasonic wall-thickness measurements of the tank were also performed. In total, nine corrosion pits were identified. Three of the pits were through-wall, three were not through-wall, and the remaining three were nearly through-wall based on comparison of the pit depths against the nominal tank wall thickness. The indications were compared against historical fuel levels. Four were at locations that were always below the lower normal level limit (i.e., always under fuel) and five were between the lower and upper normal level limits (i.e., at times exposed to air). The pits were encapsulated with two inch diameter threaded pipe half-couplings.

Based on tank level monitoring data, the location of the defects, and expected flow rate assuming all nine locations propagated through wall, engineering evaluation concluded that the intended function of the standby shutdown facility fuel oil storage tank to provide a source of oil for the standby shutdown facility diesel engines was not adversely affected by the defects identified in the tank. Since six of the corrosion pits did not penetrate the full tank wall, it was determined that the corrosion did not initiate on the outer surface of the tank. Based on the localized, random nature of the corrosion pits, including four pits located below the fuel surface and the aggressive nature of the corrosion, the degradation mechanism was determined to be microbiologically influenced corrosion. The standby shutdown facility fuel oil day tank was also inspected in 2012 and no indications of degradation was identified which indicates that this was a localized issue limited to the standby shutdown facility fuel oil storage tank.

Following the event, a review of previous fuel oil sampling results was performed to determine if programmatic changes were required. This review did not indicate any definitive trend indicating microbial growth in the standby shutdown facility fuel oil storage tank. However, the review noted a positive shift in adenosine triphosphate analysis results between June 2007 and July 2012. This shift was attributed at the time to a change in the laboratory used to perform the testing. A shift in adenosine triphosphate analysis results when the laboratories, analyzers, or even analysts is made due to the nature of the test.

Corrective actions to address the issue included the addition of periodic monitoring for boron to the oil sampling program to ensure adequate biocide concentration to prevent microbiologically influenced corrosion. Boron level serves as a measure of the presence of the Biobor JF biocide. Adenosine triphosphate analysis is also periodically performed to directly monitor potential microbial activity in the fuel. In addition, the chemistry database was updated to allow better trending of additional parameters that could indicate microbial growth including total bacterial count, total fungal count, and boron concentration. A procedure change was implemented to provide instructions for addition of biocide directly to the standby shutdown facility fuel oil storage tank, in addition to biocide addition to new fuel, when required based on operational, chemical, or physical data indicating possible microbial growth (e.g., filter plugging, adverse trends in viscosity, water and sediment, adenosine triphosphate analysis results, or biocide concentration). This issue was also submitted to INPO to ensure the ONS operating experience was shared with the industry.

The standby shutdown facility fuel oil storage tank was re-inspected in 2015, three years after the 2012 inspection and seven years earlier than the normal ten year inspection interval for the tank, as described in OE example 2 below.

OE example 1 provides objective evidence that plant-specific OE that identifies potential aging mechanisms is evaluated and used to adjust the program as necessary. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and to monitor and trend the conditions. In this case, a scheduled inspection was moved up seven years.

2. In July 2015 an inspection was completed on the ONS standby shutdown facility fuel oil storage tank. Ultrasonic testing, low frequency electromagnetic testing, and visual inspections were completed on the inside of tank. All welds (shell and support ring welds) and the shell itself were visually inspected.

   Ultrasonic testing readings were taken on the shell, heads, and any suspect areas identified during low frequency electromagnetic testing. The spot ultrasonic testing readings on the shell and the heads were taken as close as reasonably possible to the locations established during the previous inspection in 2012. The low frequency electromagnetic testing system was used to perform a 100% coverage of the shell and heads.

   A visual inspection was performed on the surface and welds of the west head and the east head of the tank. No internal corrosion was found and the heads were judged to be fit for service.

   The shell of the tank was inspected visually, with ultrasonic testing, and with low frequency electromagnetic testing. A band of minor surface corrosion was found along the bottom one inch of the internal surface of the tank but did not require repair. One external corrosion pit was found higher on the tank wall. This demonstrates that the low frequency electromagnetic testing along with the ultrasonic testing inspection is effective in identifying and quantifying external degradation. This pit will be monitored in future inspections.

   All nozzles were found to be in good serviceable condition.

   Following the inspection the tank was judged to be fit for continued service. Based on ultrasonic wall thickness readings and low frequency electromagnetic testing, the tank was determined to be acceptable for continued service for at least 20 years. The site has scheduled the next inspection in 2025 which is within ten years prior to the SPEO. Periodic inspections will continue through the SPEO on a ten year frequency.

   The 2015 inspection confirmed that the corrective actions taken following the 2012 inspection were effective in preventing microbiological induced corrosion

   OE example 2 provides objective evidence that inspections, along with the corrective action program, can effectively ensure that these components will continue to perform their intended functions, and that appropriate aging management will be performed during the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Fuel Oil Chemistry* AMP, with the noted enhancements, will provide reasonable assurance that loss of material will be adequately managed so that the intended functions of components within the scope of LR will be maintained during the SPEO.

B2.1.19 REACTOR VESSEL MATERIAL SURVEILLANCE

Program Description

The *Reactor Vessel Material Surveillance* AMP is an existing condition monitoring program that manages reduction of fracture toughness due to neutron irradiation embrittlement of the ferritic reactor pressure vessel beltline materials in a reactor coolant and neutron fluence environment. The program uses surveillance capsules containing reactor vessel material specimens that are located near the inside reactor pressure vessel wall in the beltline region so that the specimens duplicate, as closely as possible, the neutron spectrum, temperature history, and maximum neutron fluence experienced at the inner surface of the reactor vessel. As described in RIS 2014-11, beltline materials are those ferritic reactor vessel materials with a projected neutron fluence greater than 1.0E+17 n/cm^2 (E > 1 MeV) at the end of the license period (for example, the subsequent period of operation) which are evaluated to identify the extent of neutron radiation embrittlement for the material. Because of the location of the capsules between the reactor core and the reactor vessel wall, the resulting lead factor allows surveillance capsules to achieve a neutron fluence exposure earlier than the reactor pressure vessel. This allows surveillance capsules to be withdrawn and tested prior to the inner surface receiving an equivalent neutron fluence such that the surveillance test results bound the conditions at the end of the subsequent period of operation.

The *Reactor Vessel Material Surveillance* AMP, formerly a portion of the ONS reactor vessel integrity program, is an integrated surveillance program that is based on the BWOG reactor vessel integrity program, which consisted of four B&W plant utilities, five Westinghouse plant utilities with B&W fabricated reactor vessels, and Framatome (formally Babcock & Wilcox) and is now included within the PWROG. This program meets the requirements of 10 CFR Part 50, Appendix H, which requires the implementation of a reactor vessel material surveillance program when the peak neutron fluence at the end of the design life of the vessel exceeds 1.0E+17 n/cm^2 (E > 1 MeV).

This program addresses neutron embrittlement of all ferritic reactor vessel beltline materials as defined by 10 CFR Part 50, Appendix G, as the region of the reactor vessel that directly surrounds the effective height of the active core and the adjacent regions of the reactor vessel that are predicted to experience sufficient neutron damage to be considered in the selection of the limiting material with regard to radiation damage. Materials with projected neutron fluence greater than 1.0E+17 n/cm^2 (E > 1 MeV) at the end of the subsequent period of operation are considered to experience sufficient neutron damage to be included in the beltline. Materials monitored within the ONS license renewal materials surveillance program continue to serve as the basis for this AMP.

The surveillance portion of this AMP adheres to the requirements of 10 CFR Part 50, Appendix H as well as the ASTM standards incorporated by reference in 10 CFR Part 50, Appendix H. The surveillance capsule withdrawal schedule is documented in the *Reactor Material Surveillance* AMP (BAW-1543, Revision 4, Supplement 7-A), which is the implementing document for this AMP.

Through the master integrated reactor vessel program, a large amount of surveillance data are available for many of the Linde 80 weld wire heats that are located in the reactor vessels of the ONS units. For each of the weld wire heats located in the ONS units reactor vessel where surveillance data are available, test data exist from capsules removed between one and two times their projected neutron fluence after the period of subsequent license renewal except for the upper shell to lower shell circumferential weld for ONS Unit 3.

Duke Energy was a member of the BWOG reactor vessel working group. The BWOG designed an irradiation surveillance program (master integrated reactor vessel program) in which member materials are irradiated at host plants. ONS materials were irradiated at Crystal River Unit 3 and in the master integrated reactor vessel program. The master integrated reactor vessel program Charpy values and direct fracture toughness (Master Curve and Linde 80 J-integral resistance) data will be used as supplemental data. To date this program has developed one set of Charpy values, two sets of irradiated “Master Curve” data, and a Linde 80 J-integral resistance model relative to the ONS beltline materials. The PWROG is now the mechanism for the previous BWOG reactor vessel working group activities, and Duke Energy is a member of the PWROG.

The objective of the *Reactor Vessel Material Surveillance* AMP is to provide sufficient material data and dosimetry to (a) monitor irradiation embrittlement to a neutron fluence level which is greater than the projected peak neutron fluence of interest projected to the end of the subsequent period of operation, and (b) provide adequate dosimetry monitoring during the subsequent period of operation. Dosimetry monitoring during the subsequent period of operation is performed by the *Neutron Fluence Monitoring* AMP. The *Reactor Vessel Material Surveillance* AMP provides data on neutron embrittlement of the reactor vessel materials and neutron fluence data. These data are used to evaluate the TLAA on neutron irradiation embrittlement (e.g., upper-shelf energy, pressurized thermal shock, pressure-temperature limits evaluations, etc.) as needed to demonstrate compliance with the requirements of 10 CFR Part 50, Appendix G, and 10 CFR 50.61 and 10 CFR 50.61a for the subsequent period of operation.

This AMP has capsules that have neutron fluences between one and two times the peak reactor vessel wall neutron fluence of interest at the end of the subsequent period of operation (i.e., 72 EFPY). Test results from these capsules are reported, consistent with 10 CFR Part 50, Appendix H.

Select unirradiated archive reactor vessel materials (base metals and weld metals) for the Oconee units continue to be stored and maintained for possible future use. In addition, broken irradiated Linde 80 weld metal specimens from previously removed master integrated reactor vessel program capsules are being stored and available for possible future use.

This *Reactor Vessel Material Surveillance* AMP is a condition monitoring program that measures the increase in Charpy V-notch 30 foot-pound (ft-lb) transition temperature and the drop in the upper-shelf energy as a function of neutron fluence and irradiation temperature. The data from this surveillance program are used to monitor neutron irradiation embrittlement of the reactor vessel, and are inputs to the neutron embrittlement TLAA. The ONS *Reactor Vessel Material Surveillance* AMP is also used in conjunction with the proposed ONS *Neutron Fluence Monitoring* AMP.

All surveillance capsules, including those previously withdrawn from the reactor vessel, must meet the test procedures and reporting requirements of the applicable ASTM standards referenced in 10 CFR Part 50, Appendix H, to the extent practicable, for the configuration of the specimens in the capsule. Any changes to the surveillance capsule withdrawal schedule must be approved by the NRC prior to implementation, in accordance with 10 CFR Part 50, Appendix H, Paragraph III.B.3.

NUREG-2191 Consistency

The ONS *Reactor Vessel Material Surveillance* AMP is an existing program that is consistent with the ten elements of AMP XI.M31, *Reactor Vessel Material Surveillance* AMP specified in NUREG-2191 (GALL-SLR) with the exceptions described below.

Exception 1 to NUREG-2191

1. Oconee Unit 3 only:

    Each plant is to have a plant-specific surveillance program or integrated surveillance program where at least one capsule has attained or will attain neutron fluence between one and two times the peak reactor vessel wall neutron fluence at the location of interest at the end of the subsequent period of extended operation.

    For each of the Linde 80 weld wire heats located in the ONS Unit 1 and Unit 2 reactor vessels where surveillance data are available, test data exist from capsules removed between one and two times their projected neutron fluence after the period of subsequent license renewal (i.e., 72 EFPY). However, the ONS Unit 3 upper shell to lower shell circumferential weld material peak fluence is projected to be 2.01E+19 n/cm^2 (E > 1 MeV) at 72 EFPY and the respective surveillance program material (weld wire heat 72442) that has been tested has a maximum fluence of 1.95E+19 n/cm^2 (E > 1 MeV).

    Justification for Exception 1

    The original ONS Unit 3 plant-specific *Reactor Vessel Material Surveillance* AMP was designed in accordance with ASTM E185-66 and updated to meet the intent of ASTM E185-70. ASTM E185-66 required the capsule test specimens be taken from the base metal with the highest transition temperature, any weld metal, and the associated heat-affected-zone metal. Thus the weld metal included in the ONS Unit 3 plant-specific *Reactor Vessel Material Surveillance* AMP was a Linde 80 weld, but not the controlling weld metal (same heat/flux lot as the beltline region controlling weld) within the ONS Unit 3 reactor vessel. However, with the creation of the integrated reactor vessel material surveillance program and the later master integrated reactor vessel program, test specimens representing the ONS Unit 3 controlling beltline weld were made available.

    To date, tested surveillance data are available for Linde 80 weld wire heat 72442, which is the same wire heat that is used in the controlling ONS Unit 3 reactor vessel upper shell to lower shell circumferential weld. Surveillance data exist from three capsules with fluences ranging from 6.09E+18 to 1.95E+19 n/cm^2 (E > 1 MeV), which are below the projected fluence of the controlling ONS Unit 3 circumferential weld at the end of the subsequent license renewal period (2.01E+19 n/cm^2, E > 1 MeV). However, there are several other Linde 80 weld wire heats where surveillance data are available above this projected fluence, which have compositions similar to Linde 80 weld wire heat 72442. Currently there are thirteen tested surveillance capsules that are available containing Linde 80 weld metals with copper and nickel compositions similar to Linde 80 surveillance weld WF-67 (wire heat 72442). The fluences for these capsules range from 1.96E+18 to 2.14E+19 n/cm^2 (E > 1 MeV), which exceed the ONS Unit 3 end of the SLR period fluence of the upper shell to lower shell circumferential weld (2.01E+19 n/cm^2, E > 1 MeV). Because of the similarities in copper and nickel contents, the embrittlement behavior of these Linde 80 weld wire heats is expected to be nearly identical based on the trend curve prediction methods called out in RG 1.99, Revision 2.

The observed behavior of the measured surveillance test data for these Linde 80 weld metals shows similar trend responses (shift versus fluence) with expected variances based on the small differences in copper and nickel contents and expected scatter common with Charpy impact testing. In addition, the available surveillance test data all lie within the 2-sigma (+56°F) upper bound with all but one datum point falling within the 1-sigma (+28°F) upper bound, and 68.75% of the data falling below the actual predicted trend line. Therefore, in accordance with the RG 1.99, Revision 2 guidelines, the predicted shift (ΔT30) for surveillance weld WF-67 (wire heat 72442) relative to the measured data is expected to remain conservative.

The weld wire heat 72442 best estimate copper content for the ONS Unit 3 reactor vessel upper shell to lower shell circumferential weld WF-67 differs from that of the surveillance weld WF-67 (best estimate Cu = 0.26 wt% vs. surveillance weld Cu = 0.22 wt%), but their nickel contents are the same (Ni = 0.60 wt%). There are several other Linde 80 weld wire heats where surveillance data are available, which have compositions similar to the best estimate copper and nickel contents of Linde 80 weld wire heat 72442. Again because of the similarities in copper and nickel contents, the embrittlement behavior of these Linde 80 weld wire heats is expected to be nearly identical based on the trend curve prediction methods called out in RG 1.99, Revision 2.

Currently there are nine tested surveillance capsules that are available containing Linde 80 weld metals with copper and nickel compositions similar to best estimate copper and nickel contents of Linde 80 weld wire heat 72442. The fluences for these capsules range from 7.27E+17 to 3.04E+19 n/cm^2 (E > 1 MeV), which exceed the ONS Unit 3 end of the subsequent license renewal period fluence of the upper shell to lower shell circumferential weld (2.01E+19 n/cm^2, E > 1 MeV).

The observed behavior of the measured surveillance test data for these Linde 80 weld metals shows similar trend responses (shift versus fluence) with expected variances based on the small differences in copper and nickel contents and expected scatter common with Charpy impact testing. The variances are considered reasonable such that these Linde 80 weld metals can be considered similar with respect to irradiated embrittlement behavior. In addition, the available surveillance test data all lie within the 2-sigma (+56°F) upper bound with all but one datum point falling within the 1-sigma (+28°F) upper bound, and 66.67% of the data falling below the actual predicted trend line. Note that the one data point above the 1-sigma (+28°F) upper bound was at low fluence, which is not the area of interest for this assessment. Therefore, in accordance with the RG 1.99, Revision 2 guidelines, the predicted shift ($\Delta T30$) for the ONS Unit 3 upper shell to lower shell circumferential weld WF-67 (wire heat 72442) relative to the measured data is expected to remain conservative.

Exception 2 to NUREG-2191

2. Oconee Units 1, 2, and 3:

If an existing standby capsule that has been previously withdrawn from the reactor vessel is used for testing to meet the neutron fluence criterion for the subsequent period of extended operation and the capsule does not require additional irradiation, then that (formerly standby) capsule is incorporated into the surveillance capsule withdrawal schedule of the *Reactor Vessel Material Surveillance* AMP upon receipt of the subsequently renewed license, and reporting of the test results is consistent with 10 CFR Part 50, Appendix H, with the “withdrawal date” of the capsule considered to be no later than the date of the subsequently renewed license.

Disposal of irradiated plant-specific specimens in standby capsules has been reviewed by the NRC as reported in BAW-1543, Revision 4, Supplement 7-A. The existing B&W plant-specific standby capsules either do not contain weld materials or are not expected to contribute significantly to the Linde 80-weld metal surveillance database.

Justification for Exception 2

The existing B&W plant-specific standby capsules are not required to support SLR for the Oconee Units. Relevant capsule data has been obtained to support the reactor pressure vessel TLAA have neutron fluences between one and two times the peak reactor vessel wall neutron fluence of interest at the end of the subsequent period of operation (i.e., 72 EFPY), with exception of ONS-3 heat 72442. Justification for ONS-3 heat 72442 is provided above.

Exception 3 to NUREG-2191

3. Oconee Units 1, 2, and 3:

If a plant has ample capsules remaining for future use, all pulled and tested samples placed in storage with reactor vessel neutron fluence less than 37.5% of the projected neutron fluence at the end of the subsequent period of extended operation, may be discarded. All pulled and tested samples with a neutron fluence greater than 37.5% of the projected reactor vessel neutron fluence at the end of the subsequent period of extended operation and all untested capsules are placed in storage (these specimens and capsules are saved for possible future reconstitution and reinsertion use) unless the applicant has gained NRC approval to discard the pulled and tested samples or capsules.

All pulled and tested samples with a neutron fluence greater than 37.5% of the projected reactor vessel neutron fluence at the end of the SPEO and all untested capsules have not been placed in storage.

Justification for Exception 3

The samples are not expected to contribute significantly to the Linde 80-weld metal surveillance database and are not required to support SLR for the Oconee units. Relevant capsule data has been obtained to support the reactor pressure vessel TLAA have neutron fluences between one and two times the peak reactor vessel wall neutron fluence of interest at the end of the subsequent period of operation (i.e., 72 EFPY), with exception of ONS-3 heat 72442. Justification for ONS-3 heat 72442 is provided above.

Enhancements

None

Operating Experience

Based on a broad search of pertinent Oconee operating experience, the following examples provide objective evidence that the *Reactor Vessel Material Surveillance* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In 2014, an action item was initiated in the corrective action program to identify potential impacts and actions in response to a discovery by Framatome regarding a Charpy specimen orientation issue for B&W-manufactured reactor vessel beltline plates and forgings. Plate and forging materials data with unspecified Charpy specimen orientations were identified that may have been used to establish material values for certain reactor vessels. Framatome prepared a condition report to address this discrepancy. The evaluation addresses the identified condition for the Surry Unit 2 reactor vessel beltline region plate materials where a discrepancy in the initial reference temperature RT_{NDT} values was noted. The deficiency was corrected and the applicable Framatome topical reports were amended. This OE was reviewed by Oconee, and it was determined there was no impact to the reactor vessel analyses.

   OE example 1 provides objective evidence that the existing AMP activities are being effectively implemented to identify and manage aging effects of in-scope components and that the results of inspection activities are used to inform and enhance the program. Deficiencies identified during inspection activities are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct the deficiencies.

2. The *Reactor Vessel Material Surveillance* AMP continues through the Master Integrated Reactor Vessel Program. The purpose of the Master Integrated Reactor Vessel Program

is to augment the existing reactor vessel surveillance programs and to provide a basis for sharing information between plants. The shared data from the integrated program provides for the continued safe operation of the each ONS unit by managing the reduction of fracture toughness of the reactor vessel materials due to neutron embrittlement. By participating in the Master Integrated Reactor Vessel Program, the ONS units fulfill the intent and scope of 10 CFR 50, Appendix H.

OE example 2 provides objective evidence that the existing AMP activities are being effectively implemented to identify and manage aging effects of in scope components and that the results of inspection activities are used to inform and enhance the program.

3. In 2012, an action item was initiated in the corrective action program to identify actions needed to update reactor vessel integrity Time-Limited Aging Analyses (TLAAs) as a result of planned changes in the ONS fuel cycle, including (a) an increase in capacity factor, (b) Measurement Uncertainty Recapture, (c) implementation of 24-month fuel cycles, and (d) implementation of once-burned high thermal performance (HTP) fuel assemblies on the periphery. Additionally, the TLAAs were updated to account for replacing the ex-vessel dosimetry in Unit 2 (see OE example 5), and to incorporate updated fluence transport calculations to address the described changes. Actions to replace the ex-vessel dosimetry and update fluence calculations to the current end-of-life were completed in 2018.

   OE example 3 provides objective evidence that the program manager for the *Reactor Vessel Material Surveillance* AMP utilizes the corrective action program to self-identify changing plant conditions and to take timely corrective actions to assure that components will continue to perform their intended functions.

4. In 2013, an action item was initiated in the corrective action program to identify potential impacts and actions in response to a discovery by Framatome that 33 EFPY pressure-temperature (P-T) limits in use at the time for ONS Unit 3 may be nonconservative. While performing calculations for 54 EFPY P-T limit curves, it was determined that the copper value for a component in the Unit 3 reactor vessel was higher than the original value used for calculating the adjusted reference temperature (ART), which is used to calculate P-T limit curves. The ART calculated with the higher copper value was significantly higher than the original ART, which resulted in an adverse impact to the existing 33 EFPY P-T limit curves. Actions were taken to (a) require compensatory actions during plant operation until new P-T limit curves were developed and implemented, (b) review operation over the previous three cycles to ensure that the integrity of the reactor vessel had not been challenged, and (c) evaluate the adequacy of operational margins with respect to design limits. No challenges to the integrity of the Unit 3 reactor vessel were identified. The issue was resolved in 2014 when new 54 EFPY P-T limit curves were implemented.

   OE example 4 provides objective evidence that the corrective action program is being used effectively to identify and implement actions in response to newly-identified conditions such that the ability of components to perform their intended functions is maintained.

5. In 2016, an action was initiated in the corrective action program to identify that the ONS existing ex-vessel dosimetry capability should be expanded to include the extended beltline region, which includes the nozzle region and the region below the active core. This work was facilitated through Duke Energy's participation in the PWROG. Measurement data from the ex-vessel dosimetry program provides the basis for justification of neutron fluence. The work also addresses the NRC RG 1.190 requirement that licensees are required to benchmark their fluence calculational methodologies against measured data and addresses recent NRC concerns regarding the qualification basis for neutron fluence calculations outside of the traditional beltline region. This action to install ex-vessel dosimetry to monitor traditional and extended beltline regions in Unit 2 was completed in 2018.

   OE example 5 provides objective evidence that the *Reactor Vessel Material Surveillance* AMP critically self-assesses program performance and self-identifies actions that support continuous improvement and to assure that components will continue to perform their intended functions.

6. In 2020, an aging management program effectiveness review was performed on the *Reactor Vessel Integrity* program. The *Reactor Vessel Integrity* program was evaluated against the performance criteria identified in NEI 14-12 "Aging Management Program Effectiveness." The review concluded that the *Reactor Vessel Integrity* program is meeting the requirements of NEI 14-12. No gaps were identified during the effectiveness review.

   This effectiveness review provides objective evidence that the current *Reactor Vessel Integrity* program is effectively managing aging and meeting all current license renewal commitments. This provides reasonable assurance that ongoing program effectiveness will continue in the subsequent period of operation.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Reactor Vessel Material Surveillance* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Reactor Vessel Material Surveillance* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the ONS *Reactor Vessel Material Surveillance* AMP, with exceptions noted above, provides reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.20 ONE-TIME INSPECTION

Program Description

The *One-Time Inspection* AMP is a new condition monitoring program that will manage loss of material, cracking, and reduction of heat transfer of components exposed to treated borated water, treated water, waste water, raw water, air, condensation, underground, fuel oil, or lubricating oil environments. The program also manages loss of coating integrity for certain components that do not perform a pressure boundary intended function and where loss of coating integrity would not impact the intended functions of downstream components.

The *One-Time Inspection* program will conduct one-time inspections of susceptible locations to verify the effectiveness of the *Water Chemistry* program (B2.1.2), the *Fuel Oil Chemistry* program (B2.1.18), and *Lubricating Oil Analysis* program (B2.1.25). The program will verify either no unacceptable age-related degradation is occurring or require additional actions to ensure the intended function of affected components will be maintained during the SPEO. For steel components exposed to environments that do not include corrosion inhibitors, the *One-Time Inspection* program will verify that long term loss of material will not result in a loss of intended function by performing wall thickness measurements on a representative sample of components in each environment. The program also verifies that fouling is not occurring in heat exchanger tubes exposed to lubricating oil and treated water environments, that loss of material due to erosion of the high pressure safety injection minimum flow orifice is not occurring such that intended functions could be impacted, and that loss of material and/or cracking of aluminum, nickel alloy, and stainless steel in an air or condensation environment is not occurring. Additionally, the program ensures that cracking of stainless steel piping exposed to reactor cooling leakage or air in reactor vessel leakage detection piping and comparable locations in the reactor coolant system is not occurring.

The elements of the program include: (a) determination of the sample size of components to be inspected based on an assessment of materials of fabrication, environment, plausible aging effects, and OE, (b) identification of the inspection locations in the system or component based on the potential for the aging effect to occur, (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined, and (d) an evaluation of the need for follow-up examinations to monitor the progression of aging if age related degradation is found that could jeopardize an intended function before the end of the SPEO.

The program includes inspections that are focused on locations that are isolated from the flow stream, that are stagnant, or have low flow for extended periods and are susceptible to the gradual accumulation or concentration of agents that promote certain aging effects. The inspections will include a representative sample of the system population and will focus on the bounding or lead components most susceptible to aging due to time in service, and severity of operating conditions. A representative sample size of 20% of the population (up to a maximum of 25 component inspections) will be established for each material, environment, and aging effect combination. The program verifies either that unacceptable degradation is not occurring or requires additional actions be performed that will ensure the intended function of affected components will be maintained during the SPEO.

One time inspections that do not meet acceptance criteria are evaluated in accordance with the corrective action program. If any inspections do not meet the acceptance criteria, additional inspections will be conducted, unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. The number of increased inspections is determined in accordance with the corrective action program; however, no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20% of each applicable material, environment, and aging effect combination is inspected, whichever is less. If subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause analysis is conducted to determine the further extent of inspections. The additional inspections will include inspections of components with the same material, environment, and aging effect combination at all three Oconee units.

This program will not be used for components with known age related degradation mechanisms, or when the environment in the SPEO is not expected to be equivalent to that in the prior operating period. Instead, other AMPs, including programs that rely on periodic inspections, are used to manage age-related degradation of these structures and components. Inspections not conducted in accordance with ASME Code Section XI requirements will be conducted in accordance with plant-specific procedures including inspection parameters such as lighting, distance, offset, and surface conditions.

<u>NUREG-2191 Consistency</u>

The ONS *One-Time Inspection* AMP is a new program that, when implemented, will be consistent with the ten elements of AMP XI.M32, *"One-Time Inspection"* specified in NUREG-2191.

<u>Exception to NUREG-2191</u>

None

<u>Enhancements</u>

None

<u>Operating Experience</u>

Based on a search of pertinent Oconee OE, the following discussion provides objective evidence that the *One-Time Inspection* AMP will be effective in managing aging effects for structures, systems, and components within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO.

1. While the *One-Time Inspection* AMP for the SPEO is not an existing or ongoing program, Oconee does have significant OE with the implementation of one time inspections arising with the initial LRA. Oconee one time inspections associated with the initial renewed license included pressurizer examinations, the reactor coolant pump lubricating oil collection system inspection, the treated water stainless steel inspection, and the reactor building spray system inspection. The results of these inspections confirmed no

significant or unacceptable aging that could impact intended functions during the initial PEO was occurring. Oconee one-time inspections addressed a range of materials, and environments, and were performed on both a focused and a sampling basis. Inspection methods included many of the same surface and volumetric examination techniques that will be utilized for SLR inspections.

The NRC performed an inspection of Oconee implementation of LR commitments in an inspection performed during August of 2012. In the inspection, the NRC inspectors reviewed the licensing basis, program basis documents, administrative and implementing procedures to verify that the inspections were performed as described in the LRA and the corresponding NRC SER. The inspectors interviewed licensee personnel to discuss the selection process for the inspection points within the scope of the program and verify consistency with the licensing basis. The inspectors also reviewed a sample of volumetric and visual inspection results to verify that the examination and evaluation of results were performed in accordance with the implementing procedures. The NRC identified no findings during this inspection and concluded that implementation of AMP activities was consistent with the LR commitments and the conditions in the renewed operating license.

OE example 1 provides objective evidence that initial LR program commitments have been properly implemented and one-time inspections provide an effective method of verifying that significant age-related degradation is not occurring in systems with chemistry controlled service environments.

2. An item was entered into the corrective action program in 2013 to document an evaluation of preventive maintenance activities associated with cleaning and inspection of the reactor coolant pump motor lower bearing oil coolers. This evaluation included a detailed inspection and metallurgical analysis, which determined that significant material degradation of these coolers had not occurred after extended time (20 years) in service. It was further noted that fouling of these coolers was minimal and had not resulted in noticeable performance degradation of the cooler manifested in higher lower bearing oil temperatures. The results of this evaluation were used to determine the appropriate interval for periodic maintenance of the coolers.

   OE example 2 provides objective evidence that the effects of aging are appropriately evaluated in systems where significant aging is not expected to ensure reliable long term operation of components within the scope of this program.

The above two examples of OE provide objective evidence that the aging management activities and methods to be implemented by the *One-Time Inspection* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *One-Time Inspection* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *One-Time Inspection* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with Oconee CLB during the SPEO.

B2.1.21 SELECTIVE LEACHING

<u>Program Description</u>

The *Selective Leaching* AMP is a new condition monitoring program that includes a one-time inspection for components exposed to closed cycle cooling water and treated water environments since plant-specific OE has not revealed evidence of significant selective leaching in these environments, as well as opportunistic and periodic inspections for components exposed to raw water, waste water, and soil environments. Visual inspections supplemented by mechanical examination techniques such as chipping or scraping (for ductile and gray cast iron components) will be conducted. Periodic destructive examinations of components for physical properties (i.e., degree of dealloying, depth of dealloying, through wall thickness, and chemical composition) will be conducted for components exposed to raw water, waste water, and soil environments. Inspections and tests will be conducted to determine whether selective leaching is occurring and whether loss of material will affect the ability of the components to perform their intended function for the SPEO.

Components in the scope of the *Selective Leaching* AMP include piping and piping components, valve bodies, pump casings, and other components that are constructed of susceptible materials and exposed to environments conducive to selective leaching. Materials susceptible to selective leaching which are in the scope of this program are gray cast iron, ductile iron, and copper alloys containing greater than fifteen percent zinc, or greater than eight percent aluminum (aluminum bronze). Environments that promote susceptibility to selective leaching include raw water, closed cycle cooling water, treated water, waste water, and soil.

For the one-time and periodic/opportunistic portions of the program, visual inspections supplemented by mechanical examination techniques such as chipping or scraping (for ductile and gray cast iron components) will be conducted on a representative sample of components of each material and environment combination of components. A representative sample consists of three percent of each material and environment population per unit or a maximum of seven components per population per unit for periodic inspections or ten components per population for one-time inspections. When inspections are performed on piping, a one foot axial length section will be considered as one inspection. Additionally, for one time and periodic/opportunistic inspections, one destructive examination will be performed per population. The number of visual/ mechanical inspections may be reduced by two for each destructive inspection performed beyond the minimum recommended number of destructive examinations required to be performed in each ten year interval. Since Oconee is a three-unit site, a reduced periodic visual/ mechanical inspection sample size of seven components and one destructive inspection maximum per population per unit will be adopted for sample populations that are not percentage-based. This sample size reduction is acceptable because design, operating, and environmental conditions between the units are similar enough such that the aging effects are not occurring differently. All three units are of comparable age and changes to water chemistry practices, to plant equipment, and operating conditions have been implemented in a consistent manner across all three units. A measurement uncertainty recapture power uprate license amendment request was approved by the NRC in January 2021 (ADAMS Accession Number ML20335A001). Implementation of the measurement uncertainty recapture power uprate will not substantively change operating conditions such that the rate of aging effects managed by this program would be affected. No other power uprates have been implemented on any of the units. Water chemistry programs monitor various chemistry parameters and require out-of-spec conditions to be corrected under the corrective action program in a timely manner. Raw water systems for all three units draw from the same source, Lake Keowee. Therefore, a reduced sample size will provide a representative sample of the condition of the plant equipment and the existence of the aging effects involved.

Inspections are conducted in accordance with plant-specific procedures including inspection parameters such as lighting, distance, offset and surface conditions as appropriate. Results will be evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the intended functions of components throughout the SPEO based on the projected rate and extent of degradation. The acceptance criteria are: (a) for copper-based alloys, no noticeable change in color from the normal yellow color to the reddish copper color or green copper oxide; (b) for gray cast iron and ductile iron, the absence of a surface layer that can be easily removed by chipping or scraping or identified in the destructive examinations, (c) the presence of no more than a superficial layer of dealloying, as determined by removal of the dealloyed material by mechanical removal, and (d) the components meet system design requirements such as minimum wall thickness, when extended to the end of the SPEO.

When the acceptance criteria are not met such that it is determined that the affected component should be replaced prior to the end of the SPEO, additional inspections will be performed. If subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause analysis will be conducted to determine the further extent of inspections

This new program will be implemented and initial inspections will be performed within the 10-year period prior to the SPEO.

<u>NUREG-2191 Consistency</u>

The Oconee *Selective Leaching* AMP is a new program that, when implemented, will be consistent with the recommendations in NUREG-2191 XI.M33, Selective Leaching.

<u>Exception to NUREG-2191</u>

None

<u>Enhancements</u>

None

<u>Operating Experience</u>

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Selective Leaching* AMP will be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. A commitment was made during initial LR to perform a one-time inspection on a representative sample of gray cast iron components exposed to closed-cycle cooling water, treated water, and raw water environments to confirm that selective leaching was not occurring. This one-time inspection was completed in 2012. Inspections were performed on seven cast iron pump casings in the following systems:

   - auxiliary service water system - auxiliary service water system pump
   - chilled water system - chilled water pump
   - low pressure service water system - low pressure service water system pump
   - high pressure service water system - high pressure service water system pump
   - service water system - Keowee fire protection pump
   - condensate system - hotwell pump (two pumps were inspected, one in-situ and one that had been removed for maintenance)

   The inspections consisted of metallurgical replication to confirm the material of the pump was gray cast iron, visual inspection, and hardness testing. Prior to inspection and testing, the surface of the pumps was thoroughly cleaned, including use of mechanical methods such as scrapers, brushes, and abrasive paper, as required. Although mechanical examination (e.g., chipping or scraping) was not explicitly required, any damage to the pump casing while cleaning was considered a failure. A total of approximately 830 hardness measurements were obtained across the seven pumps. The results of the hardness testing and visual inspection detected no evidence of selective leaching and no damage occurred during cleaning of any of the seven pumps.

   OE example 1 provides objective evidence that initial LR program commitments have been properly implemented and that significant loss of material due to selective leaching is not typical for gray cast iron components exposed to closed-cycle cooling water, treated water, and raw water environments at Oconee.

2. For SLR, a ten year review of Oconee OE has been performed to identify occurrences of selective leaching. This review identified no evidence that loss of material due to selective leaching will adversely impact the performance of intended functions during the SPEO other than the example provided below in a raw water environment. No failures due to selective leaching were identified for components constructed of susceptible materials and exposed to closed cycle cooling water or treated water environments.

   OE example 2 provides objective evidence that significant degradation due to selective leaching is not occurring in susceptible materials exposed to closed cycle cooling water or treated water environments at Oconee, and therefore, the use of one-time inspection for selective leaching in these environments is appropriate for the SPEO.

3. In July 2018, field inspection during disassembly of a small, in-line filter assembly identified two chips in the alignment ring of the gray cast iron filter head. This filter is typically in service with low pressure service water (raw water) as the process fluid. The alignment ring consists of a thin protruding wall integral to the filter head that ensures proper alignment between the filter housing and head during re-assembly. The alignment ring is not part of the sealing surface and serves no function in the process flow path. Inspection of the filter head identified general corrosion present across the filter head

which was documented in the station corrective action program. Evaluation of the condition of the filter head concluded it was acceptable for continued service and a work request was issued to replace the filter head in accordance with the normal work scheduling process.

During the reassembly of the filter, the area around a threaded screw hole broke away from the filter head. This issue was documented in the corrective action program and the filter was replaced. The filter head was sent to the metallurgical laboratory for analysis. The metallurgical lab determined the gray cast iron filter head had experienced general corrosion over all areas exposed to raw water as well as areas of graphitic corrosion which significantly weakened the material such that failure occurred during normal maintenance. Three similar filters in the low pressure service water system have been selected for inspection to determine extent of condition. These extent of condition inspections are scheduled to be completed in 2021 and will include removal of the filter head for destructive examination at the metallurgical laboratory to determine if selective leaching is occurring in these components.

OE example 3 provides objective evidence that metallurgical examinations are effective for identifying selective leaching. The brittle failure of this filter indicates that the mechanical examination techniques such as chipping or scraping that will be performed will be effective at detecting selective leaching in gray cast iron components managed by this program.

The above examples of OE provide objective evidence that the aging management activities and methods to be implemented by the *Selective Leaching* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *Selective Leaching* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Selective Leaching* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.22 ASME CODE CLASS 1 SMALL-BORE PIPING

Program Description

The *ASME Code Class 1 Small-Bore Piping* AMP is a new condition monitoring program that will manage cracking in ASME Code Class 1 small-bore piping that is defined as greater than or equal to one-inch nominal pipe size diameter (NPS) and less than four inches NPS. This program augments the existing ASME Code, Section XI requirements and provides for examination of a sample of full penetration (butt) welds and partial penetration (socket) welds in Class 1 piping to manage cracking due to stress corrosion cracking or thermal or vibratory fatigue loading. This program will employ volumetric or destructive examinations to augment inspections performed by the *ASME Code, Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* (B2.1.1) AMP.

The *ASME Code Class 1 Small-Bore Piping* AMP will focus on socket and butt welds for piping that is susceptible to stress corrosion cracking or cracking due to thermal or vibratory fatigue loading. One-time inspections and periodic inspections will be performed for a sample population of welds, in accordance with NUREG-2191, Table XI.M35-1, to determine if cracking is occurring for locations within the scope of the *ASME Code Class 1 Small-Bore Piping* program including full penetration (butt) and partial penetration (socket) welds. Since such cracking can initiate from the inside diameter of the piping, volumetric or destructive examination methods will be employed to detect cracks that may originate from the inside diameter of butt welds, socket welds, and their base metal materials. The extent and schedule for volumetric examination in this program is based on plant-specific OE and whether actions have been implemented that effectively mitigate the cause(s) of any past cracking.

Butt Welded Piping

Age-related cracking has been identified in ONS Class 1 small-bore piping butt weld populations and, therefore, the program will perform periodic examinations to monitor for cracking of butt welds within the scope of the *ASME Code Class 1 Small-Bore Piping* program. Periodic examinations of 10 percent of the butt welds within the scope of this program will be performed every 10 years, up to a maximum of 25 welds per unit. Although ONS has effectively performed corrective actions to address and mitigate the causes of the leaks that have occurred on each unit (either through design changes, improved maintenance outage practices, or increased inspections/replacements for certain locations where corrective action to preclude cracking is not feasible), periodic inspections of small-bore butt welds for Oconee Unit 1, 2, and 3 will be performed in accordance with Category C, as defined by NUREG-2191, Table XI.M35-1. Accordingly, for each unit, periodic volumetric or destructive inspections of susceptible butt welds will be performed with the first examinations completed within the 6-year period prior to the SPEO and subsequent examinations completed every 10 years during the SPEO.

Socket Welded Piping

Age-related cracking has not been identified in Class 1 small-bore socket welded piping on Oconee Unit 1, 2 or 3. As a result, a one-time examination of these welds will be performed in accordance with Category A, as defined by NUREG-2191, Table XI.M35-1. A one-time inspection of 3 percent of the socket welds within the scope of this program, up to a maximum of

10 welds per unit, will be performed for each ONS unit within the 6-year period prior to the SPEO. The examination method will be volumetric or destructive with welds selected for examination from locations determined to be most risk significant and most susceptible to cracking. Because more information can be obtained from a destructive examination than from a nondestructive volumetric examination, as stated in NUREG-2191, Table XI.M35-1, each socket weld subject to destructive examination will be credited as equivalent to having volumetrically examined two welds toward the number of required inspections. If evidence of cracking is identified during the one-time inspections, periodic examinations of ten percent of the socket welds within the scope of this program will be performed every ten years.

The following *ASME Code Class 1 Small Bore Piping Welds* table provides a summary of the inspections required for ONS Units 1, 2 and 3 Class 1 small bore piping:

Table B1-1 ASME Code Class 1 Small Bore-Piping Welds

Unit	Weld Type	Table XI.M35-1 Category	Examination	Total Weld Population	Sample Size[1] (Percent/Number Requiring Inspection
1	Butt	C	Periodic	265	25 (10% up to 25)
1	Socket	A	One-time	91	3 (3% up to 10)
2	Butt	C	Periodic	448	25 (10% up to 25)
2	Socket	A	One-time	108	4 (3% up to 10)
3	Butt	C	Periodic	393	25 (10% up to 25)
3	Socket	A	One-time	86	3 (3% up to 10)

Note 1: Number of inspections required are rounded up to the nearest whole number

Volumetric examinations will employ techniques that have been demonstrated to be capable of detecting flaws and discontinuities in the examination volume of interest. Destructive examination methods may be used in lieu of volumetric examination. If cracking is revealed by an inspection, the condition will be entered into the corrective action program and additional inspections will be performed for the population of welds (butt welds or socket welds) that have experienced cracking in accordance with ASME Section XI, Sub-article IWB-2420; and periodic inspections will continue to be performed in accordance with NUREG-2191, Table XI.M35-1, Category C.

This new ONS *ASME Code Class 1 Small-Bore Piping* AMP will be implemented within the 6 years prior to the SPEO. Initial periodic examinations for the butt weld populations on each ONS unit will be completed within the 6 years prior to the start of the SPEO, and no later than 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO. Subsequent periodic examination campaigns for butt welds will also be completed every 10 years during the SPEO. One-time inspections will be completed for the socket weld populations for each ONS unit within the 6 years prior to the start of the SPEO, and no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.

Industry and plant-specific OE will be evaluated in the development and implementation of this program.

NUREG-2191 Consistency

The Oconee *ASME Code Class 1 Small-Bore Piping* AMP is a new program that, when implemented, will be consistent with the ten elements of AMP XI.M35, *ASME Code Class 1 Small-Bore Piping* specified in NUREG-2191 (GALL-SLR).

Exception to NUREG-2191

None

Enhancements

None

Operating Experience

Based on a search of pertinent ONS OE, the following examples provide objective evidence that the *ASME Code Class 1 Small-Bore Piping* AMP will be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. The OE search for this AMP included the corrective action program, metallurgical laboratory reports, and programmatic inspection results.

A comprehensive review of all available plant specific ONS Unit 1, 2 and 3 OE was performed during the development of the ONS SLRA to identify all issues of cracking or leaks in ASME Code Class 1 small-bore piping (less than 4 inch NPS and greater than or equal to 1 inch NPS). As documented below, cracking of small-bore socket welds has not occurred at ONS but has occurred in certain small-bore butt weld locations. These cracking events occurred due to design considerations unique to the specific location where the crack occurred or improper outage practices that have subsequently been corrected and do not indicate that cracking of small-bore butt welds is prevalent at ONS. In instances where corrective actions to preclude cracking were not feasible, additional inspections are performed (i.e., augmented ISI inspections) to monitor for cracking and initiate replacement, as required. Regardless, the *ASME Code Class 1 Small-Bore Piping* AMP will perform periodic examinations of a representative sample of small-bore butt welds in accordance with Category C, as defined in Table XI.M35 of NUREG-2191 to ensure that cracking of these welds is adequately managed during the SPEO.

<u>ONS Unit Specific Plant Operating Experience</u>

Each instance of age-related cracking (i.e., stress corrosion cracking and cracking due to thermal or vibratory fatigue loading) of ASME Code Class 1 small bore piping (less than four inches nominal pipe size and greater than or equal to one inch nominal pipe size) that was identified during the review of ONS OE is summarized below for each ONS unit.

<u>Unit 1</u>

1. In January 1998, a leak was discovered in a butt welded 90-degree elbow on the ONS Unit 1 pressurizer surge line drain line. A crack had developed in a butt weld on the drain line from the pressurizer surge line (Reference: LER 269/98-02).

   The component was removed and sent for metallurgical analysis. Destructive examination determined the failure was caused by a combination of stress corrosion cracking that developed on the external weld surface coupled with a mechanical vibration that drove the crack through- wall. The corrosive environment on the exterior surface of the piping was determined to be caused by regular outage decontamination and wash down practices that may have provided chlorides and moisture needed for stress corrosion cracking to occur. During the investigation of the leak, destructive examination and internal surface examinations showed no evidence of inside diameter-initiated cracking in the drain line. The metallurgical report noted evidence of fatigue striations and scattered ductile rupture away from the crack origins. This suggests mixed-mode (stress corrosion cracking/fatigue) propagation after crack initiation.

   Corrective actions completed included performing penetrant testing at affected weld locations on the pressurizer surge line prior to removal of drain line for replacement. The results of the non-destructive examinations revealed no indications. An extent of condition investigation was completed which included performing additional penetrant testing non-destructive exams for Class 1 butt welds on Unit 1 as well as both Unit 2 and 3 Class 1 butt welds that are not included in the ISI program (pipe diameter 1 inch or less). Penetrant testing surface examination is an appropriate inspection technique since the leak was caused by externally initiated stress corrosion cracking. No evidence of cracking was identified during these examinations.

   A corrective action was completed to perform chemistry analysis on the pressurizer surge line including the removed portions of the pressurizer surge drain line in accordance with the power chemistry materials guide program. This action confirmed that chlorides on the outside diameter of the surge drain line exceeded limits. Additional corrective actions were initiated to document and clean all affected areas.

In addition, entries were made into the corrective action program to further investigate and determine the source of the vibration on the pressurizer surge line drain. The apparent cause analysis confirmed the cause of the pipe leak to be cracking initiation by external chloride induced stress corrosion cracking and propagation by a mixed mode of stress corrosion cracking and fatigue. Corrective actions completed included replacement and reanalysis of the Unit 1 pressurizer surge drain line. Other completed corrective actions included improved procedures with better preventive measures to minimize introduction of corrosives (such as chlorides) into to the plant environment.

Although this chloride contamination event was caused by improper outage practices that have since been corrected and can be considered event-driven rather than age-related, this OE example is conservatively considered evidence that cracking of small-bore butt welds could occur at ONS Unit 1. Mitigation has been completed, including replacement and reanalysis of the pressurizer surge drain line piping and improvement of outage practices to ensure that chloride contamination of stainless-steel piping susceptible to stress corrosion cracking does not occur. Periodic surface inspections of the pressurizer surge drain nozzle are currently performed as augmented inspections in accordance with the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* (B2.1.1) program. Although mitigation of the pressurizer surge line has been completed, small-bore butt welds will conservatively be inspected in accordance with Category C, as defined in Table XI.M35 of NUREG-2191.

2. In November 2013, a reactor coolant system pressure boundary leak was identified at a high-pressure injection line nozzle during a Unit 1 reactor building walkdown. An entry was made into the corrective action program and shutdown was initiated in accordance with Technical Specifications.

   The leak was from a circumferential crack in the safe end to pipe butt weld located between the high-pressure injection nozzle and the reactor coolant system loop injection block valve. A root cause evaluation determined that mechanical vibration induced high cycle fatigue caused a through wall crack. A system design that resulted in higher than desired system vibration on the high-pressure injection line and inadequate administrative guidance for conduct of augmented examinations were identified as contributing causes. During analyses used to support the root cause evaluation for the safe end to pipe leak, the potential for flow cavitation and subsequent erosion of the high-pressure injection piping elbows immediately downstream of the in-line flow orifices was identified. This cavitation degradation is believed to be the result of the high pressure injection full flow tests that are performed at the end of each refueling outage to verify the operation of the high-pressure injection system and confirm it can deliver the required flow rates for various high-pressure injection nozzle configurations. Cavitation is likely with flow rates above 100 gpm through the 0.78” orifices.

Corrective actions were initiated to prevent recurrence including the following:

- Leaking weld replaced
- Increased frequency of high-pressure injection nozzle safe end-to pipe butt weld ultrasonic inspections for lines that have higher vibration potential
- Inspected all high-pressure injection lines using diverse techniques
- Implemented a means, in program governance procedures, to ensure the critical elements of the inspection procedures used to implement augmented inspections are incorporated into revised or new superseding procedures
- Revised all program procedures to incorporate root cause lessons learned

As outlined above, significant program improvements were made including increased rigor and improved basis documentation information for all augmented ISI examinations performed at ONS. These AMP improvements were made to ensure aging effects are properly evaluated and future examinations are scheduled commensurate with the safety significance of the component.

The following two augmented exams were added for Oconee Unit 1, 2 and 3 to manage aging effects and prevent recurrence.

- High pressure injection nozzle volumetric inspections of safe end to pipe butt welds to identify cracking
- High pressure injection system piping elbow ultrasonic testing wall thickness measurements for wall thinning due to cavitation (NOTE: Cavitation erosion of the elbows just downstream of the high-pressure injection flow orifices is managed by the *Flow Accelerated Corrosion* (B2.1.8) AMP).

Although high-cycle fatigue is typically considered a design issue rather than aging, this OE is conservatively considered evidence that cracking of small-bore butt welds could occur at ONS Unit 1 and, therefore, periodic inspections will be performed in accordance with Category C, as defined in Table XI.M35-1 of NUREG-2191. This OE example also provides objective evidence that the corrective action program was used effectively to identify the cause of the weld failure, identify the population of welds within the extent of condition, and implement appropriate comprehensive corrective actions, including increased frequency of ISI augmented examinations and programmatic enhancements.

3. In November 2014, during the Unit 1 outage, ultrasonic examinations were performed on the RCS drain line piping downstream of the RCS connection. ASME Section XI Code rejectable indications were detected on the exterior curve of the first elbow in the drain line off the Unit 1 RCS cold leg. The issue was documented in the corrective action program for evaluation and follow-up actions. The degraded condition was a 17% through-wall leak on the 1.5” drain line elbow due to thermal fatigue failure. The 1.5” RCS Drain Line piping is butt welded out to the first isolation valve.

Corrective actions included replacement of the leaking elbow and adjacent piping prior to restart from the 2014 outage, performance of examinations at other susceptible drain line locations, and revision of program documentation to include more frequent examinations of the drain line elbows. As a result, examinations at this location are performed every other refueling outage in accordance with the ONS Augmented Inservice Inspection Schedule.

This OE example involved thermal fatigue in the base metal of Unit 1 cold leg loop butt welded drain piping. This OE provides objective evidence that the corrective action program is used effectively to identify and evaluate the cause of RCS and connected piping age related cracking occurrences, and to initiate corrective actions to identify the population within the extent of condition and correct adverse conditions.

<u>Unit 2</u>

4. In April 1997, a leak was identified in the ONS Unit 2 butt weld connecting the piping to the nozzle safe end on one of the two normal high pressure injection lines. The cause was a through-wall crack in the butt weld connecting the makeup/high pressure injection pipe and the safe-end of a reactor coolant loop nozzle.

   This leak at an ONS Unit 2 safe end to high pressure injection/makeup line weld prompted re-inspection of all high-pressure injection nozzles, safe ends and thermal sleeves. Further examination found a gap in the contact area between the thermal sleeve and the safe-end, indicative of loss of contact that caused the thermal sleeve in this line to become loose. The thermal sleeve was found to be cracked, with portions missing from the end that extends into the reactor coolant system flow path. Significant wear damage was observed at both the upstream and the downstream end. Cracking was also found in the pipe in the vicinity of the "warming" line nozzle. Examinations of the other thermal sleeves of the high-pressure injection system showed no evidence of damage. Ultrasonic testing and radiographic testing of the welds and the thermal sleeves in the other Unit 2 high pressure injection nozzles showed no indications of cracking or loosening, or other signs of degradation. The thermal sleeve in the Unit 2 high pressure injection/makeup line was replaced with a new safe end and new thermal sleeve design.

   Metallurgical examination determined the crack consisted of an inside surface flaw. The metallurgical analysis also indicated that crack initiation and propagation in the pipe to safe-end weld was caused by high-cycle fatigue due to a combination of thermal cycling and flow induced vibration. This phenomenon was identified as the probable cause for similar safe-end cracking observed at other industry pressurized water reactors (including ONS) in the early 1980's (Reference: Information Notices IN 97-46 and 82-09, and Generic Letter 85-20).

   Although high-cycle fatigue is typically considered a design issue rather than aging, this OE example is conservatively considered evidence that inside diameter cracking of small-bore butt welds could occur at ONS Unit 2 on the thermal sleeves and, therefore, periodic inspections will be performed in accordance with Category C, as defined in Table XI.M35-1 of NUREG-2191. This example also provides objective evidence that the corrective action program is used effectively to identify and evaluate the cause of RCS and connected piping age related cracking occurrences, and to initiate corrective actions to identify the population within the extent of condition and correct adverse conditions.

Unit 3

5. No age-related failures have occurred in Unit 3 small bore piping butt welds. However, since the design of ONS Unit 3 is similar to ONS Unit 1 and Unit 2, periodic examinations of small-bore butt welds will be performed in accordance with Category C, as defined in Table XI.M35 of NUREG-2191.

Units 1, 2 and 3

6. As a result of interactions between the B&W Owner's Group and the NRC on BAW-2243A, *Demonstration of the Management of Aging Effects for the Reactor Coolant System Piping*, the B&W Owner's group utilities committed to perform an additional sample inspection of Class 1 small-bore piping (piping less than 4-inch size) to provide assurance that potential cracking of small bore reactor coolant system piping is adequately managed such that the small bore piping can perform its intended function during the period of extended operation. As described in NUREG-1723, *Safety Evaluation Report related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3*, ONS committed to a small-bore piping inspection program that would verify that service induced weld cracking is not occurring in small-bore RCS piping. The purpose of the one-time inspections was to gain confidence in the current condition of the small bore reactor coolant system piping at ONS which does not receive a volumetric examination and to gain insights into the acceptability of the current ASME Section XI actions to manage the aging of these lines.

   A total of 59 one-time inspections were completed on ONS butt welds and butt welded components across all three units by the fall of 2010 in support of the ONS commitment for small-bore piping inspections. Specifically, 55 butt welds were subject to in situ ultrasonic testing and four piping segments containing butt welds were destructively examined, as described further below. No evidence of cracking was identified during these examinations. More than 60% of the examinations were for a component that was in service more than 30 years. More than 80% of the examinations were for a component that was in service more than 20 years.

   - A Unit 1 metallurgy report describes the destructive examination of a 2½ inch x 2½ inch x 1½ inch butt welded, Schedule 160, Type 316 stainless steel tee from the ONS Unit 1 pressurizer spray line that was removed in 2009 and was later submitted to the metallurgy lab for evaluation. This line was selected because it was potentially susceptible to thermal fatigue. No cracking or other damage was detected on the pressurizer main to auxiliary spray tee.
   - A Unit 2 metallurgy report describes the destructive examination of a 2½ inch x 2½ inch x 1½ inch butt welded, Schedule 160, Type 316 stainless steel tee from the ONS Unit 2 pressurizer spray line was removed in 2010. This line was selected because it was potentially susceptible to thermal fatigue. No cracking or other damage was detected on the pressurizer main to auxiliary spray tee.
   - A Unit 3 metallurgy report describes the destructive examination of a one-foot long section of 1- inch Schedule 160 stainless steel pipe that was removed in 2011 from the ONS Unit 3 high pressure injection warming (minimum flow) line between two welds. Past evaluations of the high-pressure injection normal makeup sleeves

damaged by thermal fatigue had concluded that there was a potential for periodic reverse-flow through, and associated thermal fatigue of, the warming line. No cracking or other service-related degradation was observed on the ONS Unit 3 high pressure injection warming line section.

- A Unit 3 metallurgical analysis report describes the destructive examination of the ONS Unit 3 Pressurizer Steam Space Sample Line in 2011. A 4¾ inch long section of ½ inch Schedule 160 stainless steel pipe was removed from the ONS Unit 3 pressurizer steam space sample line. This line was selected because it was potentially susceptible to thermal fatigue and other degradation mechanisms. No cracking or other service-related degradation was observed on the ONS Unit 3 pressurizer steam space sample line segment.

This OE example provides objective evidence that as of 2010, when the initial license renewal small bore piping one-time inspections were performed, age-related cracking of small-bore butt welds was not prevalent. This indicates that the examples provided above where leaks have occurred are discrete issues caused by design factors unique to the specific location where the crack occurred or improper outage practices that resulted in local chloride contamination induced SCC.

Based on the review of OE summarized above, there have been no age-related socket weld failures of ASME Code Class 1 piping that is less than four inches nominal pipe size and greater than or equal to one inch nominal pipe size on any of the three ONS units. Therefore, the *ASME Small Bore Inspection Piping* AMP will perform Category A inspections for socket welds. Since there has been age-related cracking in small bore piping butt welds at ONS, periodic inspections will be performed for all ONS Units 1, 2 and 3, in accordance with Category C, as defined in Table XI.M35-1 of NUREG-2191.

The above examples of OE provide objective evidence that the aging management activities and methods to be implemented by the *ASME Code Class 1 Small Bore Piping* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *ASME Code Class 1 Small Bore Piping* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *ASME Code Class 1 Small Bore Piping* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.23 EXTERNAL SURFACES MONITORING OF MECHANICAL COMPONENTS

Program Description

The *External Surfaces Monitoring of Mechanical Components* AMP is a new condition monitoring program that will manage the following aging effects:

- Loss of material, cracking, and reduction of heat transfer of metallic components;
- Hardening or loss of strength, loss of material, and cracking or blistering of polymeric components;
- Hardening or loss of strength, and loss of material of elastomeric components;
- Loss of material, cracking, and loss of preload for heating, ventilation, and air conditioning closure bolting; and
- Reduced thermal insulation resistance

Visual inspections of accessible external surfaces will be performed during system inspections and walkdowns. The inspection parameters for metallic components will include material condition, which consists of evidence of rust, pitting, crevice, and general corrosion; surface imperfections such as cracking and wastage; coating degradation such as cracking, flaking, or blistering; evidence of insulation damage or wetting; leakage from piping, ducting, or component bolted joints; and accumulation of debris on heat exchanger surfaces exposed to air. Coating degradation will be used as an indicator of possible degradation on underlying component surfaces. Inspection parameters for elastomeric and polymeric components will include blistering, hardening, discoloration, surface cracking, crazing, scuffing, loss of thickness, exposure of internal reinforcement, and dimensional changes. For certain materials, such as elastomers and flexible polymers, physical manipulation to detect hardening or loss of strength will be used to augment the visual inspections conducted under this program.

Periodic visual inspections, not to exceed a refueling outage interval, of accessible surfaces of metallic, polymeric, and elastomeric components, and insulation metallic jacketing (or protective outer layer if metal jacketing is not used) will be conducted. This frequency will accommodate inspections of components in locations that are normally only accessible during refueling outages. Surfaces that are not readily visible during plant operations or refueling outages will be inspected when they are made accessible and at such intervals that will ensure the components intended functions are maintained. There are no cementitious components within the scope of this program.

Surface examinations or ASME Code, Section XI visual examinations (VT-1) will be conducted to detect cracking of copper alloy (>15% zinc or >8% aluminum) components exposed to air or condensation environments. A representative sample will be performed from each of the copper alloy (>15% Zn) and copper alloy (>8% aluminum) component populations every ten years. Examinations will be conducted on 20% of the surface area unless the component is measured in linear feet, such as piping. Alternatively, any combination of a minimum of 25 one-foot axial length sections and components will be inspected.

A sample of outdoor component surfaces that are insulated and a sample of indoor insulated components exposed to condensation (due to the in-scope component being operated below the dew point), will be periodically inspected every ten years during the SPEO. Following removal of insulation, surface examinations or ASME Code, Section XI VT-1 examinations will be conducted to detect loss of material and cracking of the component surfaces. A minimum of 20% of the in-scope piping length, or 20% of the surface area for components whose configuration does not conform to a one-foot axial length determination will be inspected. Alternatively, any combination of a minimum of 25 one-foot axial length sections and components for each material type will be inspected.

If any sampling-based inspections to detect cracking in copper alloy (>15% zinc) or copper alloy (>8% aluminum) do not meet the acceptance criteria, then additional inspections will be conducted, unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. There will be no fewer than five additional inspections for each inspection that does not meet acceptance criteria, or 20% of each applicable material, environment, and aging effect combination inspected, whichever is less. If any subsequent inspections do not meet acceptance criteria, then an extent of condition and extent of cause analysis in accordance with the corrective action program will be conducted to determine the further extent of inspections required. The additional inspections will be completed within the same interval (i.e., ten year inspection interval) in which the original inspection was conducted. Additional samples will be inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. The additional inspections will include inspections of components with the same material, environment, and aging effect combination at each of the Oconee units.

Inspections will be performed by personnel qualified in accordance with site procedures and programs to perform the specified task. Inspections within the scope of the ASME Code will follow site procedures consistent with the ASME Code. Non-ASME Code inspection procedures will include requirements for items such as lighting, distance, offset, surface coverage, and presence of protective coatings.

Acceptance criteria will be such that the component will meet its intended function until the next inspection or until the end of the SPEO, whichever is shorter. Quantitative acceptance criteria, such as required minimum wall thickness, will be used where practical. For qualitative evaluations, applicable parameters such as change in hardness, flexibility, or surface condition will be used to reasonably ensure that a consistent determination is made based on the observed conditions.

The external surfaces of components that are buried or in underground environments are inspected by the *Buried and Underground Piping and Tanks* (B2.1.26) program. The external surfaces of outdoor tanks are inspected by the *Outdoor and Large Atmospheric Metallic Storage Tanks* (B2.1.17) program. Loss of material due to boric acid corrosion is managed by the *Boric Acid Corrosion* (B2.1.4) program. The *One-Time Inspection* (B2.1.20) program will confirm the absence of cracking for external surfaces of aluminum and stainless steel components for which the aging effect is not expected to occur based on plant OE.

NUREG-2191 Consistency

The *External Surfaces Monitoring of Mechanical Components* program is a new program that, when implemented, will be consistent with NUREG-2191, Section XI.M36, External Surfaces Monitoring of Mechanical Components.

Exception to NUREG-2191

None

Enhancements

None

Operating Experience

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the *External Surfaces Monitoring of Mechanical Components* AMP will be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO.

1. In the fall of 2009, water was found dripping from insulation installed on service water piping located in the basement of the turbine building. The insulation was removed for inspection and the piping was found to be heavily corroded. Engineering evaluation identified a through-wall leak due to internal corrosion of the steel piping which was the cause of the external corrosion under the insulation. This issue was entered into the corrective action program, and the leak was monitored until the corroded section of piping was replaced during the next available work window.

   OE example 1 provides objective evidence that visual inspection of external insulation surfaces can identify accumulation of moisture underneath the insulation, and that use of the corrective action program is an effective process for correcting identified deficiencies.

2. An oil leak from a breathing air compressor hydraulic hose was identified in October 2012. The issue was entered into the corrective action program. Subsequent inspection identified a black hose that was noted as brittle to the touch and which had a visible bulge on the exterior surface. Inspection of the hose after removal noted interior degradation at the same location where the bulge was located. The degraded hose was replaced with a new hose.

   OE example 2 provides objective evidence that visual inspection and physical manipulation of elastomers is capable of identifying changes in material properties which are indicative of degradation, and that use of the corrective action program is an effective process for correcting identified deficiencies.

3. A plant walkdown was conducted at the Keowee hydroelectric station in August 2013 which identified rust on cooling water strainers and piping in the depressing air gallery. The issue was entered into the corrective action program. The areas of rust were removed from the affected components and the surfaces were repainted with upgraded coating.

OE example 3 provides objective evidence that system inspections and walkdowns are an appropriate method for monitoring the condition of external surfaces, and that use of the corrective action program is an effective process for correcting identified deficiencies.

The above examples of OE provide objective evidence that the aging management activities and methods to be implemented by the *External Surfaces Monitoring of Mechanical Components* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *External Surfaces Monitoring of Mechanical Components* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *External Surfaces Monitoring of Mechanical Components* AMP will provide reasonable assurance that the effects of aging will be managed such that the components within the scope of this program will continue to perform their intended functions consistent with the CLB during the SPEO.

B2.1.24 INSPECTION OF INTERNAL SURFACES IN MISCELLANEOUS PIPING AND DUCTING COMPONENTS

Program Description

The *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* AMP is a new condition monitoring program that will manage loss of material and cracking of metallic components, as well as loss of material, cracking, blistering, hardening, and loss of strength of polymeric and elastomeric materials. The program also manages loss of coating integrity for certain components that do not perform a pressure boundary intended function and where loss of coating integrity would not impact the intended functions of downstream components. Reduction of heat transfer and flow blockage will also be managed. This program will consist of visual inspections of internal surfaces of piping, piping components, ducting, heat exchanger components, polymeric and elastomeric components, and other mechanical components. Applicable environments include air, condensation, closed cycle cooling water, diesel exhaust, fuel oil, gas, lubricating oil, raw water, treated water, and waste water. Except for elastomeric and polymeric components, aging effects associated with components within the scope of the *Open Cycle Cooling Water System* (B2.1.11) AMP, *Closed Treated Water Systems* (B2.1.12) AMP, and Fire Water System (B2.1.16) AMP will not be managed by this program.

Steel piping exposed piping exposed to raw water in the high pressure service water system and Keowee fire detection/protection system having only CLB intended functions of leakage boundary (spatial) as defined in the NUREG-2192, Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants Table 2.1-4(b) is managed for loss of material (due to general, pitting, crevice corrosion and microbiologically influenced corrosion) by this program. Steel piping in these systems is susceptible to recurring internal corrosion but this program is not credited to manage recurring internal corrosion. The *Open-Cycle Cooling Water Systems* (B2.1.11) program supplements this program and provides for management of recurring internal corrosion for steel piping exposed to raw water in the high pressure service water system and Keowee fire detection/protection system.

This program relies on internal inspections performed during the periodic system and component surveillances or during the performance of maintenance activities when the surfaces are made accessible for visual inspection. The program includes visual inspections and when appropriate, surface examinations. For certain materials, such as flexible polymers, physical manipulation to detect hardening or loss of strength is used to augment the visual examinations conducted under this program. This program relies on periodic visual (VT-1) or surface examinations to manage cracking due to stress corrosion cracking in stainless steel components exposed to diesel exhaust, potable raw water, and waste water and in copper alloys exposed to waste water. Visual inspections may be conducted in lieu of VT-1 or surface examinations where it has been analytically demonstrated that surface cracks can be detected by leakage prior to a crack challenging the structural integrity or intended function of the component.

At a minimum, in each 10-year period during the SPEO a representative sample of 20 percent of the population (defined as components having the same combination of material, environment, and aging effect) or a maximum of 25 components per population per unit are typically inspected. However, since Oconee is a three-unit site, this maximum number will be reduced to 17 components per population per unit where the sample size is not based on a percentage of the population. This is acceptable because design, operating, and environmental conditions between the units are similar enough such that the aging effects are not occurring differently. All three units are of comparable age, and changes to water chemistry practices, operating conditions, etc., have been implemented in a consistent manner across all three units. A measurement uncertainty recapture power uprate license amendment request was approved by the NRC in January 2021 (ADAMS Accession Number ML20335A001). Implementation of the measurement uncertainty recapture power uprate will not substantively change operating conditions such that the rate of aging effects managed by this program would be affected. No other power uprates have been implemented on any of the Oconee Units. Water chemistry programs monitor various chemistry parameters and require out-of-spec conditions to be corrected under the corrective action program in a timely manner. Raw water systems for all three units draw from the same water sources. Oconee has only one (standby shutdown facility) diesel generator, such that distribution of diesel generator run times is not an issue. Therefore, a reduced maximum sample population size will provide a representative sample of the condition of the plant equipment and the existence of the aging effects involved.

This program does not manage cracking due to stress corrosion cracking or loss of material in aluminum exposed to aqueous solutions and air environments, or to stainless steel components exposed to air environments. A review of plant OE has not identified the existence of these aging effects in aluminum and stainless steel components in these environments. Therefore, one-time inspections will be performed for these material, environment, and aging effect populations under the *One-Time Inspection* (B2.1.20) program to verify that these aging effects are not applicable. If cracking or loss of material is identified during the one-time inspections, periodic inspections will be performed under the appropriate AMP, which may include this program as applicable.

NUREG-2191 Consistency

The *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* AMP will be consistent with the ten elements of AMP XI.M38, *“Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”* specified in NUREG-2191.

Exception to NUREG-2191

None

Enhancements

None

Operating Experience

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the *Inspections of Internal Surfaces of Miscellaneous Piping and Ducting Components* AMP will be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO.

1. In September 2009, while performing routine preventive maintenance activities on the primary instrument air system, a crack was identified in the strainer body where a threaded nipple is connected. A work request was initiated to repair the strainer, and the item was entered in the corrective action program to document the deficiency and to consider whether a routine preventive maintenance task should be considered to periodically replace the strainer body based on age. The engineering evaluation of this item determined that the existing quarterly preventive maintenance inspections were sufficient to identify degradation, and that the strainer body will continue to be monitored and replaced on condition, as appropriate.

   OE example 1 provides objective evidence that opportunistic visual inspections performed during existing preventive maintenance activities are an effective method for identifying degraded conditions and that the corrective action program is an effective tool for resolving identified issues.

2. Maintenance activities in 2018 identified a crack in the Unit 3 reactor building auxiliary fan ductwork. Work order completion records document that the ductwork has an opening of fourteen inches long and two inches wide. The crack is located at a pocket lock joint and runs partially across the bottom of the duct and turn slightly up the backside of the duct and stops at the duct joint. There is a duct support on either side of the crack. An item was entered into the corrective action program to identify the deficiency, document the engineering evaluation, and address ongoing inspection and monitoring activities. Additional reviews of the inspection documentation, determined that the crack does not pose a safety issue, and would have little effect on system performance. A corrective action was implemented to revise preventive maintenance activities for the reactor building auxiliary fan ducting to ensure that focused monitoring is performed of this location each outage.

   OE example 2 provides objective evidence that the corrective action program is appropriately used to adjust recurring preventive maintenance activities when evidence of degradation is identified to ensure that intended functions are maintained.

3. In October 2010, internal sleeves for the two condenser circulating water expansion joints were found damaged during outage inspections. The inspection discovered a small hole in a seal near the backing plate overlap. In addition, the center band had slipped resting one side on the lower band while the other side was wedged over the backing plate near the top band. Upon disassembly it was found that the backing plate was damaged, and bent out of shape. The offset of the joint measured 2.875 inches. There were also two bulges in backing plate. The larger of the two measured 4 inches long and 2 inches wide. The other bulge measured 2 inches round. An extent of condition evaluation noted that other Unit 3 outlet water box seals were found to be in excellent shape. There were no issues with bands or backing plates, bugles or any other defects noted. Repair was accomplished with the installation of a new seal and backing plate.

   OE example 3 demonstrates the ability of opportunistic inspections to identify degradation well before intended functions are affected. The use of the corrective action program and follow up actions demonstrate that extent of condition is considered, that evaluations are done to ensure intended functions are maintained (including consideration of potential adverse spatial interactions), and that effective measures are put into place to prevent recurrence. In addition, this OE provides objective evidence that the aging management activities provided by this program will effectively identify degradation of elastomers.

4. A review of Oconee OE over a ten year period (January 2011 through January 2021) has revealed recurring internal corrosion in steel piping exposed to raw water within the scope of the *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* AMP. Through wall leakage due to localized piping degradation has occurred on several occasions. When leakage has been identified, the issue has been entered into the corrective action program and appropriate corrective actions have been taken including increased inspections, piping repair or replacement, and modifications to install more corrosion resistant piping materials.

   In addition, there have been several occasions over the ten year review period where wall thickness measurements have identified remaining wall thickness less than preestablished screening criteria or less than 50% of nominal wall thickness. General corrosion rates at Oconee are typically on the order of one to two mil per year due to the high quality of raw water from Lake Keowee. Challenges to required minimum wall thickness are normally due to localized corrosion. The specific corrosion mechanism cannot be definitively established through wall-thickness measurements and so are conservatively assumed to be indicative of recurring internal corrosion as defined in Section 3.3.2.2.7 of NUREG-2192. When wall- thickness below conservative screening criteria has been identified, the issue has been entered into the corrective action program and appropriate corrective actions have been taken including reevaluation of required minimum wall thickness, piping repair or replacement, and modifications to install more corrosion resistant piping materials.

   Recurring internal corrosion of water-based fire suppression system piping will be managed by the *Open-Cycle Cooling Water System* (B2.1.11) AMP. The material of construction and service environment are equivalent between the open-cycle cooling water systems and the water-based fire suppression systems and, therefore, managing recurring internal corrosion of these systems as a single population is appropriate. The *Open-Cycle Cooling Water System* (B2.1.11) program will inspect a representative sample of locations with conditions that are characteristic of the conditions found throughout raw water filled systems at Oconee. The results of these inspections are then extrapolated to similar locations throughout all the raw water systems within the scope of SLR. This characteristic-based approach recognizes the commonality among the component materials of construction and the environment to which they are exposed.

   OE example 4 provides objective evidence that plant OE is reviewed and evaluated for indications of recurring internal corrosion and appropriate corrective actions are taken to ensure aging is adequately managed.

The above examples of OE provide objective evidence that the aging management activities and methods to be implemented by the *Internal Surfaces in Miscellaneous Piping and Ducting Components* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *Internal Surfaces in Miscellaneous Piping and Ducting Components* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Internal Surfaces in Miscellaneous Piping and Ducting Components* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.25 LUBRICATING OIL ANALYSIS

Program Description

The *Lubricating Oil Analysis* AMP is an existing preventive program that ensures loss of material and reduction of heat transfer is not occurring in important plant equipment by maintaining the quality of lubricating oil and hydraulic oil. The program ensures that contaminants, particularly water and particulates, are within acceptable limits and are consistent with manufacturer and industry guidelines.

The program directs condition monitoring activities (sampling, analyses, and trending), thereby maintaining an environment that is not conducive to loss of material or reduction of heat transfer.

The lubricating oil testing (sampling and analysis) and condition monitoring activities identify detrimental contaminants such as water, sediments, and specific wear elements. The contaminant levels are trended in the program's database. Corrective actions are initiated when any of the contaminant levels exceed the acceptance criteria limit. Corrective actions typically include evaluating, identifying, and correcting the source of the detrimental contaminants.

In summary, the *Lubricating Oil Analysis* AMP applies monitoring methods that are effective in maintaining the quality of the oil environment in mechanical systems and avoiding significant equipment degradation.

NUREG-2191 Consistency

The *Lubricating Oil Analysis* AMP is an existing program that will be consistent with the ten elements of AMP XI.M39, *"Lubricating Oil Analysis"* specified in NUREG-2191 (GALL-SLR) with the enhancement described below.

Exception to NUREG-2191

None

Enhancements

The following enhancement will be implemented in the following program element: Detection of Aging Effects (Element 4)

1. Update the *Lubricating Oil Analysis* program procedures to specify that in all cases, phase-separated water in any amount is not acceptable (Element 4).

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Lubricating Oil Analysis* program will continue to be effective in managing the aging effects for systems and components within the scope of the program so that intended functions will be maintained consistent with the CLB during the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. A February 2010 lube oil analysis of a Keowee governor bearing oil sample indicated high lead and a high general particle count. The sample indicated 313 ppm lead for Keowee Unit 1 and 223 ppm lead for Keowee Unit 2 compared to the 100 ppm lead standard. A condition report was initiated in the corrective action program and a new preventive maintenance strategy was developed for the governor bearing oil. The following corrective actions were taken to implement the new preventive maintenance strategy:

    - Keowee turbine guide bearing oil operating temperatures were monitored and trended. Engineering evaluation of trending results did not indicate any increase of turbine guide bearing temperatures.
    - Two work orders were created that completely replaced the turbine guide bearing oil for both Keowee Units 1 and 2.
    - System filtration requirements established to be performed per manufacturer's guidelines.
    - The turbine guide bearing sampling frequency was doubled as a result of the high particle count.

    OE example 1 provides objective evidence that the *Lubricating Oil Analysis* program inspections, along with the corrective action program, will effectively monitor in scope lubricating oil to provide reasonable assurance that contaminants are within acceptable limits and that lubrication oil is maintained consistent with manufacturer and industry guidelines during the SPEO.

2. A September 2012 lab analysis of a semi-annual oil sample from the Keowee Unit 1 governor oil indicated that the viscosity was low for the reported oil type/grade. Other test results were reported as satisfactory. A condition report was initiated in the corrective action program, and a recommendation was made to re-sample at the next scheduled interval. Since the next scheduled interval would be in six months, a second sample was taken on 10/18/2012 and a *"Remaining Useful Life Evaluation Routine"* test using linear sweep voltammetry was ordered. A *"Rotating Pressure Vessel Oxidation Test"* was also ordered to evaluate the remaining oxidation life of the oil. The results of the analysis of the second sample indicated that the additive package in the oil was depleted. The oil could no longer withstand oxidation and the oil pH had begun to change. The rise in the acidity of the oil was the cause of the low viscosity found earlier and the acidity in the oil was leaving equipment vulnerable to damage. The recommendation was to replace at least half of the oil. All the governor oil was subsequently replaced on 11/1/2012.

    OE example 2 provides objective evidence that the *Lubricating Oil Analysis* program inspections, along with the corrective action program, will effectively monitor in scope lubricating oil to provide reasonable assurance that contaminants are within acceptable limits and that lubrication oil is maintained consistent with manufacturer and industry guidelines during the SPEO.

3. On April 18, 2017, the results of an oil sample analysis from the 1B motor drive feedwater pump indicated 0.1% water. A decision was made to place the 1B MFDWP back on the

1B lube oil purifier for a week to improve the oil quality and remove the water. A work request was written to perform another oil sample on April 24, 2017 after a week on the lube oil purifier. The analysis of the April 24, 2017 sample tested in high fault in bacterial contamination, but the water content had fallen to 0.0510%. The normal frequency was doubled for placing the 1B motor drive feedwater pump oil tank on the 1B lube oil purifier. After the reduction of water content was established, a subsequent sample lab analysis results indicated that the bacterial intrusion had been eliminated. Additional sampling of the 1B motor drive feedwater pump oil tank confirmed that the lube oil purifier to be effective at reducing the containments and water content. However, analysis of oil samples from the 1B motor drive feedwater pump oil tank taken on November of 2017 once again indicated an increase in both contaminants and water content. A condition report was initiated in the corrective action program, and inspections of the 1B motor drive feedwater pump oil tank for possible in-leakage were performed.

These inspections identified a steam leak from the 1B feedwater pump turbine steam seal header drain pipe as the likely source of the water intrusion into the tank.

OE example 3 provides objective evidence that the *Lubricating Oil Analysis* AMP inspections, along with the corrective action program, will effectively monitor in scope lubricating oil to provide reasonable assurance that contaminants are within acceptable limits and that lubrication oil is maintained consistent with manufacturer and industry guidelines during the SPEO.

4. The current standby shutdown facility diesel generator lubrication oil sample and analysis program began on 2/20/2001. During the 19 years of program implementation, the standby shutdown facility diesel generator lubricating oil has been sampled on over 250 occasions and confirmed to be in acceptable condition by tracking the following parameters:

   - Water content in accordance with ASTM D6304, *Standard Test Method for Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration*
   - Viscosity in accordance with ASTM D7279, *Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids by Automated Houillon Viscometer*
   - The Titration Acid Number in accordance with ASTM D664, *Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration*
   - The presence of 21 wear metals, contaminants and additives in the lubrication oil in accordance with ASTM D5185, *Standard Test Method for Multi-element Determination of Used and Unused Lubricating Oils and Base Oils by Inductively Coupled Plasma Atomic Emission Spectrometry*.

   OE example 4 provides objective evidence that the *Lubricating Oil Analysis* program inspections are being performed in accordance with industry guidelines.

The above examples provide objective evidence that the *Lubricating Oil Analysis* program will continue to be effective in managing the aging effects for systems and components within the scope of the program so that intended functions will be maintained consistent with the CLB during the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Lubricating Oil Analysis* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Lubricating Oil Analysis* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.26 BURIED AND UNDERGROUND PIPING AND TANKS

Program Description

The *Buried and Underground Piping and Tanks* AMP is an existing condition monitoring program that manages loss of material and cracking on external surfaces of piping and tanks in soil or underground environments within the scope of SLR through preventive and mitigative actions. The program addresses piping and tanks composed of carbon steel, ductile iron, gray cast iron, stainless steel and copper alloys. There is no buried or underground cementitious or polymeric piping within the scope of SLR at Oconee. Loss of material and cracking of bolting associated with buried and underground piping systems is also managed by this program.

The program manages aging through preventive and mitigative actions (i.e., coatings, backfill quality, and cathodic protection), relies on inspection activities, including visual examination of buried and underground piping and tanks, electrochemical verification of the effectiveness of the cathodic protection system, nondestructive evaluation of pipe or tank wall thicknesses, and performance monitoring of fire mains. The number of inspections is based on the effectiveness of the preventive and mitigative actions.

Annual cathodic protection system surveys are conducted to monitor structure-to-soil potential and cathodic protection current. The program uses the -850 mV relative to copper/copper sulfate reference electrode, instant off criterion specified in NACE SP0169-2007 for acceptance criteria for determination of cathodic protection system effectiveness in performing cathodic protection surveys.

Inspections are conducted by qualified individuals. Where the coatings, backfill, or the condition of exposed piping does not meet acceptance criteria the condition is entered into the corrective action program for evaluation. Degraded conditions such as loss of material, damaged coatings, non-conforming backfill, or improper cathodic protection system voltage are evaluated under the corrective action program to determine appropriate corrective actions.

The program relies on monitoring of system header pressure and annual leak rate testing for aging management of the buried piping in the high pressure service water system, which serves as the fire protection system for Oconee. The program relies on system flow monitoring and annual flow testing for aging management of the buried Keowee fire detection/protection system piping. In addition, opportunistic visual inspections of the external surface of buried high pressure service water system and Keowee fire detection/protection system piping will be performed when the piping is excavated for any reason.

This program does not address loss of material due to selective leaching. The *Selective Leaching* (B2.1.21) program is used to manage loss of material due to selective leaching of susceptible materials.

The *Buried and Underground Piping and Tanks* AMP will be enhanced as described below to provide reasonable assurance that buried and underground piping and tanks and components, constructed of carbon steel, ductile iron, gray cast iron, stainless steel and copper alloys will perform their intended function during the SPEO.

NUREG-2191 Consistency

The *Buried and Underground Piping and Tanks* AMP is an existing program that will be consistent with NUREG-2191, Section XI.M41, *Buried and Underground Piping and Tanks* with exceptions and enhancements, as described below, respectively.

Exception 1 to NUREG-2191

Program Element Affected: Preventive Actions (Element 2)

1. NUREG-2191 recommends that coatings and cathodic protection be provided for buried copper alloy piping. The buried copper alloy instrument air system piping is not coated, and cathodic protection is not provided.

   Justification for Exception 1

   The copper alloy Instrument Air System piping within the scope of the *Buried and Underground Piping and Tanks* AMP supplies compressed air from a dedicated air compressor and air tank to level instrumentation for the elevated water storage tank. A modification will be completed prior to entry into the SPEO to abandon this buried copper alloy piping.

Exception 2 to NUREG-2191

Program Element Affected: Detection of Aging Effects (Element 4)

2. NUREG-2191 recommends the limiting critical potential for cathodic protection systems should not be more negative than -1200 mV. The Oconee *Buried and Underground Piping and Tanks* AMP will maintain the instant-off potential of all test locations between -850 mV and -2000 mV

   Justification for Exception 2

   The cathodic protection system for the standby shutdown facility diesel engine fuel oil tank was installed in 2010 to replace the original passive sacrificial anode system. Due to the location of the tank and space limitations in the area, anodes could not be installed on the south side of the tank that is adjacent to the standby shutdown facility building wall. Also, the design depth for the anodes on the north side of the tank could not be obtained due to a shallow bedrock layer in the area. In order to achieve adequate polarization at test locations for the south side of the tank, an instant-off potential more negative than - 1200 mV was required for test locations for the north side of the tank.

   The -1200 mV limiting critical potential recommendation is designed to minimize damage to the coating of buried structures caused by excessive cathodic protection current (i.e., cathodic disbondment). This criterion is intended to prevent coating damage for all coating systems in common use for buried structures. The coating used for the standby shutdown facility diesel engine fuel oil tank is a two part system consisting of a high build epoxy primer and a high build coal tar epoxy finish coat. Epoxy coating systems are less susceptible to cathodic disbondment than other coating systems such as tape wrap coatings.

Damage to the external coating, should it occur, would not impact the intended function of the standby shutdown facility diesel engine fuel oil tank. However, damage to the external coating would increase the amount of exposed metal surface area and could potentially challenge the ability of the cathodic protection system to provide adequate current to provide effective mitigation of corrosion. The cathodic protection system for the standby shutdown facility diesel engine fuel oil tank is designed with sufficient capacity to provide additional current if coating damage were to occur. The Oconee *Buried and Underground Piping and Tanks* AMP will be enhanced to require trending of cathodic protection current data to identify changes that could indicate coating degradation and to ensure that the cathodic protection current demand remains within the capacity of the system design such that adequate protection of the tank is ensured (i.e., instant-off potential is more negative than -850 mV for all test locations).

In addition to the enhanced monitoring described above, the *Oconee Fuel Oil Chemistry* (B2.1.18) and *Buried and Underground Piping and Tanks* (B2.1.26) AMPs provide for periodic internal inspection and wall thickness monitoring of the buried standby shutdown facility diesel engine fuel oil tank at least once every ten years.

The combination of inspections and cathodic protection system monitoring provide reasonable assurance that age-related degradation of the standby shutdown facility diesel engine fuel oil tank will be managed such that intended functions will be maintained consistent with the current licensing basis through the SPEO.

Exception 3 to NUREG-2191

Program Element Affected: Detection of Aging Effects (Element 4)

3. NUREG-2191 recommends ten linear feet of piping be exposed during each inspection. The Oconee *Buried and Underground Piping and Tanks* AMP exposes a quadrant of ten linear feet of buried steel condenser circulating water system piping during each inspection.

Justification for Exception 3

The buried steel condenser circulating water system piping consists of large diameter (96-inch to 132-inch) low pressure piping that supplies cooling water from the intake to the main condensers. The only other buried steel piping within the scope of the program is the 16-inch supply line and the 12-inch return line for the radwaste equipment cooling system that take suction from and discharge to the 132-inch condenser circulating water system ‘B’ intake pipe. The radwaste equipment cooling system does not perform any SLR intended functions and the supply and return lines are only in scope as part of the pressure boundary of the large diameter condenser circulating water system piping. The intended function of the large diameter piping is to provide a source of water for safety related cooling systems and for water-based fire suppression systems. It is also credited with providing water for decay heat removal through the main condenser during certain non-power operation fire scenarios in accordance with NFPA 805. The flow required to perform the SLR intended functions is significantly less than the design flow during normal operation when this piping provides cooling water to the main condenser to condense steam from the Main Turbine and maintain condenser vacuum. Therefore, pinhole leaks will not impact the SLR intended functions of this piping as long as structural integrity of the piping is maintained.

Given the size of this piping, excavation and visual inspection of 360 degrees of the circumference of the pipe is not feasible. Inspection of a quadrant of ten linear feet of the piping (i.e., 9 to 12 o'clock or 12 to 3 o'clock) will provide a sufficient representative sample to determine the condition of the piping. To supplement the external inspection, low frequency electromagnetic testing will be performed from the internal surface of the entire circumference of the same ten linear foot section of piping that is externally inspected. Follow-up ultrasonic wall thickness measurements will be performed of areas identified as low points during the low frequency electromagnetic testing inspection. The minimum number of external visual inspections and internal nondestructive examinations will be determined based on the effectiveness of preventive actions in accordance with NUREG-2191, Table XI.M41-2. In addition, internal visual inspections of 100% of the buried condenser circulating water system piping are performed on a six-year frequency to detect indications of through-wall leaks. The combination of direct visual inspections, internal nondestructive examination, and internal visual inspection for leakage will provide reasonable assurance that the intended functions of the buried condenser circulating water system piping will be maintained.

<u>Enhancements</u>

The following enhancements shall be implemented in the respective program elements: Preventive Actions (Element 2), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), Acceptance Criteria (Element 6), and Corrective Actions (Element 7)

1. Install a cathodic protection system in accordance with NACE SP0169-2007 for buried carbon steel piping within the scope of the program (Element 2).

2. Complete a modification to abandon the buried copper alloy instrument air system piping within the scope of this program. (Elements 2 and 3)

3. Annual cathodic protection system monitoring will be performed with a maximum grace period of two months. The system will be monitored at least once during each calendar year. (Element 2)

4. Utilize an inspection method that has been demonstrated to be capable of detecting cracking for uncoated stainless steel piping and when visual inspections of coated stainless steel piping detect coating degradation or damage which could potentially result in stress corrosion cracking of the base material. Indications of cracking will be evaluated

in accordance with applicable codes and plant-specific design criteria. (Elements 3, 6 and 7)

5. Perform wall thickness measurement if visual inspections identify evidence of corrosion beyond minor surface rusting for both coated and uncoated metallic piping or tanks. The results of the wall thickness measurement will be used to calculate a corrosion rate and project wall thickness through the end of the SPEO. If the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material is extrapolated to the end of the SPEO, then additional inspections will be performed as follows: When measured pipe wall thickness, projected to the end of the SPEO, does not meet the minimum pipe wall thickness requirements due to external corrosion, the number of inspections within the affected piping category will be doubled or increased by five, whichever is smaller. If adverse indications are found in the expanded sample, an extent of condition and extent of cause analysis to determine the further extent of condition and extent of cause. Timing of any additional inspections will be based on the severity of the identified degradation and the consequences of leakage or loss of function. Any additional inspections will be performed within the same 10-year inspection interval in which the original degradation was identified, or within four years after the end of the 10-year interval if the degradation was identified in the latter half of the 10-year interval. Expansion of sample size may be limited by the extent of piping subject to the observed degradation mechanism or if the piping system or portion of the system is replaced or otherwise mitigated within the same 10-year inspection interval in which the original degradation was identified or within four years after the end of the 10-year interval, if the degradation was identified in the latter half of the 10-year interval. (Elements 4, 5, 6, and 7)

6. Perform inspections of buried steel condenser circulating water system piping at least once every ten years. The minimum number of inspections will be determined based on the effectiveness of preventive actions in accordance with NUREG-2191, Table XI.M41-2. Ten linear feet of piping will be exposed for each inspection. Inspections of the large diameter condenser circulating water system intake piping will expose a quadrant (i.e., 9 to 12 o'clock or 12 to 3 o'clock) of the piping. External inspections of the large diameter condenser circulating water system intake piping will be supplemented by low frequency electromagnetic testing performed from the internal surface of the same section of piping that is externally inspected with follow-up ultrasonic wall thickness measurements performed of areas identified as low points during low frequency electromagnetic testing. (Element 4)

7. Perform visual inspections of at least two ten-linear foot sections of buried uncoated stainless steel piping at least once every ten years. Piping inspection locations will be selected based on risk (i.e., susceptibility to degradation and consequences of failure). (Element 4)

8. Perform visual inspections of at least four ten-linear foot sections of underground coated steel piping at least once every ten years. Piping inspection locations will be selected based on risk (i.e., susceptibility to degradation and consequences of failure). (Element 4)

9. Internal volumetric inspections of the standby shutdown facility diesel engine fuel oil tank will cover at least 25% of the surface area of the tank and include at least some of both the top and bottom of the tank. (Element 4)

10. Personnel performing inspections of buried coated piping and tanks will either: 1) possess an Association for Materials Protection and Performance coating inspector program level 2 or level 3 inspector qualification, 2) complete the EPRI *Comprehensive Coatings Course* and complete the EPRI *Buried Pipe Condition Assessment and Repair Training Computed Based Training Course*, or 3) be qualified as a coatings specialist in accordance with ASTM D7108. (Element 6)

11. If significant coating damage is identified during visual inspections, then perform an evaluation to determine if the coating damage was caused by nonconforming backfill. If it is determined that the coating damage was caused by nonconforming backfill, then conduct an extent of condition evaluation to determine the extent of degraded backfill in the vicinity of the observed damage. (Element 7)

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Buried and Underground Piping and Tanks* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In September 2019 a self-assessment was performed to verify the regulatory compliance and on-going effectiveness of selected LR AMPs and the overall LR program. The assessment included a review of LR documentation, procedures, completed work orders, corrective action program documents and interviews. Commitments made during the initial LR for Oconee credited the periodic internal inspections of system piping implemented through the condenser circulating water system internal coatings inspection (UFSAR Section 18.3.17.5) program for aging management of buried piping and the standby shutdown facility diesel fuel oil storage tank inspection (UFSAR Section 18.3.17.14) for aging management of the buried tank. This program was evaluated as part of this self-assessment and the review confirmed that aging management activities are being performed in accordance with commitments made during the initial LR process.

   An area for improvement was identified related to the condenser circulating water system internal coatings inspection. The results of internal inspections of the condenser circulating water system piping is intended to serve as representative of other buried piping systems within the scope of LR at Oconee. The self-assessment identified that there was insufficient guidance in program documentation to ensure that appropriate evaluation of extent of condition is performed if unacceptable degradation is identified. This issue was entered into the corrective action program and program documentation has been revised to include guidance to perform extent of condition evaluations if inspection results are unacceptable.

OE example 1 provides objective evidence that aging management activities have been implemented in accordance with initial LR commitments and that self-assessments are used to identify and implement programmatic improvements.

2. An in-line ultrasonic inspection of buried Unit 1 standby shutdown facility auxiliary service water system piping (evaluated with the condenser circulating water system for SLR) was performed during the Fall 2016 refueling outage. This inspection provided wall thickness measurements for approximately 280 feet of six-inch diameter schedule 80 carbon steel piping externally coated with coal tar epoxy. The inspection was performed to address system operating history of previous occurrences of pipe leaks in 2006 and 2009 that resulted in the replacement of portions of the buried steel piping with stainless steel in system piping for all three Oconee units. All average pipe wall thicknesses were greater than the mill tolerance value. However, the inspection identified numerous indications of localized wall loss. An external visual inspection of a portion of this piping was also performed and identified a number of areas of missing coatings with general surface corrosion and some localized pitting. An engineering evaluation was performed and concluded the piping was significantly degraded but remained operable. To ensure the continued reliability of the system, the remaining buried carbon steel piping in the standby shutdown facility auxiliary service water subsystem for all three Oconee units was replaced with externally coated stainless steel with all piping replacements completed by 2018.

   OE example 2 provides objective evidence that the inspection techniques utilized by this program are capable of detecting degradation of buried piping and that appropriate corrective actions are taken when degraded conditions are identified to ensure intended functions are maintained.

3. Inspections of portions of the condenser circulating water system intake and discharge piping were performed in 2009, 2013, and 2014. The 2009 inspection was performed from the external surface when a portion of the eleven foot diameter 0.375 inch thick piping was exposed during construction of the protected service water building. The 2013 and 2014 inspections were performed from the internal surface of the Unit 2 and Unit 3 discharge piping, respectively. The results of these inspections are summarized below.

   The March 2009 inspection was performed on the portion of the Unit 3 intake piping exposed during construction of the protected service water building and included visual inspection of five sections of piping and low frequency electromagnetic testing of three of those sections. Each piping section was defined as the area between reinforcement ribs which is approximately ten linear feet. No evidence of wall loss was identified by low frequency electromagnetic testing. Ultrasonic testing of random locations on the piping was performed to validate the low frequency electromagnetic testing results and all readings were above nominal wall thickness. The visual inspection of the piping identified numerous areas of localized coating degradation with minor surface corrosion and two areas of localized corrosion. The larger pit had a diameter of approximately 0.75 inch and a depth of approximately 0.25 inch. An engineering evaluation was performed and concluded that the piping was acceptable for continued service. Areas of coating degradation were repaired but, since the system was in service during the inspection, a weld repair of the areas exhibiting localized corrosion was not performed.

The October 2013 inspection was performed on a forty foot section of the Unit 2 condenser circulating water system discharge piping. The inspection was performed using a four inch flat-bottomed scanner to inspect a four foot wide strip at the four o'clock and nine o'clock positions. No significant areas of wall loss were detected during the inspection with wall loss less than ten percent for all sections inspected. Ultrasonic testing of the area inspected by low frequency electromagnetic testing was also performed on approximately fourteen-inch centers with results indicating an average wall thickness of 0.355 inch. The lowest reading was 0.339 inch. All readings were above the minimum required wall thickness for the discharge pipe of 0.313 inch. The corrosion rate was calculated to be 0.001 inch per year and the piping was determined to be acceptable for continued service.

The April 2014 inspection was performed around the entire circumference of an approximately eleven-linear foot segment of the Unit 3 condenser circulating water system discharge piping. The low frequency electromagnetic testing scan of this piping identified no evidence of pitting or wall thinning with all areas inspected indicating wall loss less than ten percent. Ultrasonic testing of the area inspected by low frequency electromagnetic testing was also performed on fourteen-inch centers with results indicating an average wall thickness greater than the nominal wall thickness of 0.375 inch. The lowest reading was 0.359 inch. All readings were above the minimum required wall thickness for the discharge pipe of 0.313 inch. The corrosion rate was calculated to be less than 0.001 inch per year and the piping was determined to be acceptable for continued service.

OE example 3 provides objective evidence that appropriate inspections are performed to monitor the condition of buried piping and that the external environment of buried components at Oconee is generally not conducive to aggressive corrosion.

4. The original design of the standby shutdown facility diesel engine fuel oil tank included a passive cathodic protection system that relied on sacrificial anodes to mitigate corrosion. A modification was completed in 2010 to replace the passive system with an impressed current cathodic protection system due to depletion of the original sacrificial anodes. In 2017, a separate modification was completed which installed tornado protection for the standby shutdown facility building cable trench. During this modification, the reference electrode test box for the system was removed which prevented the measurement of tank-to-soil potentials during subsequent annual surveys. A modification was proposed to reinstall the test box but upon further evaluation it was determined that the modification was not required since the connection to the tank is still accessible to perform the test. A revision to the testing procedure has been completed to address the issue and reestablish the annual survey.

   The annual survey was successfully completed in February 2021. The results of testing for one location did not meet the -850 mV relative to copper/copper sulfate reference electrode acceptance criterion. The instant-off potential for this location was -795 mV relative to copper/copper sulfate reference electrode. This issue was documented in the corrective action program and rectifier adjustments were made to achieve instant-off potential more negative than the -850 mV relative to copper/copper sulfate reference electrode for all test locations. Although the 100 mV alternative acceptance criterion is not relied upon by this program, during system design and installation, the native potential for this location was recorded to be -444 mV relative to copper/copper sulfate reference electrode which indicates that the alternative acceptance criterion would have likely been satisfied and provides reasonable assurance that the tank was adequately protected since the last successful performance of the test.

Testing results for the standby shutdown facility diesel engine fuel oil tank cathodic protection system performed to date do not indicate any adverse trend in system performance. Other than the result for one location during the February 2021 test, the results of testing completed to date have confirmed instant off potential more negative than -850 mV relative to copper/copper sulfate reference electrode for each location during each performance of the test.

The standby shutdown facility diesel engine fuel oil tank was inspected in 2012 and 2015. Visual and low frequency electromagnetic testing were performed of 100% of the accessible internal surface area during both inspections. Ultrasonic testing was of areas of concern identified by low frequency electromagnetic testing and as directed by engineering. The 2012 inspection identified and repaired nine indications of internally initiated microbiologically influenced corrosion, as discussed further in the *Fuel Oil Chemistry* (B2.1.18) AMP. No indications of externally initiated degradation were identified in 2012. The 2015 inspection identified one indication of localized external degradation. The measured wall thickness at this location was calculated to remain above the minimum required wall thickness based on a conservative corrosion rate of 0.002 inch per year through the next scheduled inspection. Wall thickness at this location will be measured during the next inspection to confirm that the newly installed impressed current cathodic protection system has arrested active corrosion.

OE example 4 provides objective evidence that Oconee has taken appropriate actions to restore cathodic protection for the standby shutdown facility diesel engine fuel oil tank and that inspections performed to monitor the condition of the tank are effective.

5. In February 2019, a self-assessment was performed of the Duke fleet buried piping program. The objectives of the assessment were to determine if all procedural requirements were being fulfilled (including all requirements to meet NEI 09-14 and initial LR commitments), determine if the program was being implemented consistently across the fleet, and validate the scope of the program. The assessment identified no significant gaps related to the implementation of the existing Oconee program. The assessment identified several potential opportunities for improvement of the Oconee program that required further evaluation but only one was related to equipment within the scope of SLR. The assessment team noted a duplication of planned work with both a one-time work order to clean and inspect the buried standby shutdown facility diesel engine fuel oil tank and an existing periodic maintenance work order that performs the same task. The duplicate work order has been deleted and the tank is scheduled to be inspected in 2025. The performance of the additional inspection was to confirm the effectiveness of corrective actions taken to address a leak from the standby shutdown facility Diesel Fuel Oil Tank, as described further in the *Fuel Oil Chemistry* (B2.1.18) AMP.

OE example 5 provides objective evidence that the *Buried and Underground Piping and Tanks* AMP includes periodic assessments which are effective in ensuring the program objectives are being met and opportunities for improvements are being implemented.

6. In February 2012, a self-assessment was performed in preparation for the NRC TI 2515/182, *"Review of the Implementation of the Industry Initiative to Control Degradation of Underground Piping and Tanks"* inspection. The objectives of the assessment were to evaluate the station's compliance with NEI 09-14 and to determine the efficacy and robustness of the Oconee program. The assessment identified no significant gaps related to the implementation of the Oconee program or compliance with NEI 09-14. The assessment identified the three potential opportunities for improvement of the Oconee program. The program opportunities for improvement and resolutions are summarized below:

- No procedural guidance existed to notify the buried pipe engineer when trenches or vaults containing underground piping were opened. To address this issue, the work order planning guide was revised to alert appropriate organizations when removal of covers from trenches or vaults occurs so that opportunistic inspections can be performed.
- The self-assessment could not confirm that all buried piping leaks had been reported to INPO as required by NEI 09-14. A review of the corrective action program was performed following the completion of the self-assessment and identified three instances where the issue was not reported to INPO or where the report had to be updated to clarify that the reported leak was from a buried component. These three instances are not directly relevant to the Oconee *Buried and Underground Piping and Tanks* AMP since the leaks occurred on equipment that is not subject to aging management review. Two new reports were created to allow the Oconee OE to be shared with the industry and the existing report was revised to specify that the reported leak was from a buried component. Current procedures require any leaks from buried or underground piping or tanks within the scope of the NEI 09-14 program or within the scope of LR to be reported to INPO to ensure Oconee OE is shared with the industry.
- Inadequate assessment of the condition of buried and underground piping that has experienced leaks or has been previously repaired may have been performed. A review of the corrective action program was performed following the completion of the self-assessment and identified three instances of leaks within the scope of the program where inadequate assessment of the remaining piping run was performed. Two of these leaks occurred on piping that is not within the scope of SLR (buried PVC plant drinking water system pipe and underground steel vacuum system pipe). The third leak occurred in 2009 on the Unit 2 standby shutdown facility auxiliary service water system piping. All of the original carbon steel buried piping in this system has since been replaced as described in OE example 2, above. Current procedures include guidance regarding sample expansion to bound and characterize the extent of the condition to ensure that appropriate assessment of the condition of buried and underground piping occurs in the event of leaks or unsatisfactory inspection results.

OE example 6 provides objective evidence that the Oconee program has been implemented in accordance with NEI 09-14 guidance and that self-assessments are effective in ensuring the program objectives are met and opportunities for improvements are implemented.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Buried and Underground Piping and Tanks* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Buried and Underground Piping and Tanks* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Buried and Underground Piping and Tanks* AMP, with enhancements noted above, will provide reasonable assurance that aging effects will be adequately managed such that the components within the scope of this program will continue to perform their intended functions consistent with the CLB during the SPEO.

B2.1.27 INTERNAL COATINGS/LININGS FOR IN-SCOPE PIPING, PIPING COMPONENTS, HEAT EXCHANGERS, AND TANKS

Program Description

The *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* AMP is a new condition monitoring program that includes visual inspections of internal coatings/linings of ductile iron, and carbon steel piping, piping components, tanks, heat exchangers exposed to raw water, treated water, treated borated water, or lubricating oil. There are no internally coated or lined piping, piping components, heat exchangers, or tanks exposed to closed-cycle cooling water, waste water, fuel oil, air, or condensation within the scope of this program. This program is not used to manage the integrity of coatings applied to external surfaces of piping or components.

Other than for buried fire header piping, the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* program will include periodic visual inspections to verify the integrity of internal coatings designed to adhere to and protect the base metal. For tanks and heat exchangers, all accessible surfaces are inspected. Piping inspections are sampling-based. Inspection intervals are established by a coating specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54. However, inspection intervals should not exceed those specified in NUREG-2191, AMP XI.M42, Table XI.M42-1, *"Inspection Intervals for Internal Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers."* Opportunistic inspections will be performed for cement-lined buried water-based fire suppression system piping.

The training and qualification of individuals involved in coating/lining inspections of non-cementitious coatings/linings are conducted in accordance with ASTM International Standards endorsed in RG 1.54, *"Service Level I, II and II Protective Coatings Applied to Nuclear Power Plants,"* including the NRC guidance contained in RG 1.54 associated with a particular standard. For cementitious coatings/linings, inspectors should have a minimum of five years of experience inspecting or testing concrete structures or cementitious coatings/linings or a degree in the civil/structural discipline and a minimum of one year of experience. Inspection results that do not satisfy established acceptance criteria are entered into the Oconee 10 CFR 50, Appendix B corrective action program. The corrective action program ensures that conditions adverse to quality are promptly corrected.

The program will be implemented through various station procedures and work activities. Inspections are performed for signs of coating failures and precursors to coating failures including peeling, delamination, blistering, cracking, flaking, chipping, rusting, and mechanical damage. Peeling and delamination is not acceptable. Blisters are evaluated by a coatings specialist, and should be limited to a few intact small blisters that are completely surrounded by sound material, and with size and frequency not increasing between inspections. Minor cracks in cementitious coatings are acceptable provided there is no evidence of debonding. Coatings/linings that do not meet acceptance criteria are repaired, replaced, or removed. Physical testing is performed where physically possible (i.e., sufficient room to conduct testing) or examination is conducted to ensure that the extent of repaired or replaced coatings/linings encompass sound coating/lining material. These inspections, and subsequent repairs, replacements, or evaluations of internal coatings will provide reasonable assurance that in scope components and downstream components will meet CLB intended functions for the SPEO.

Aging of the internal coating for the elevated water storage tank will be managed as described in the *Fire Water System* (B2.1.16) program.

NUREG-2191 Consistency

The *Oconee Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* AMP is a new program that will be consistent with the ten elements of AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks” specified in NUREG-2191 (GALL-SLR), as modified by SLR-ISG-2021-02-MECHANICAL, “Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance” with the following exceptions.

Exception 1 to NUREG-2191

Program Element Affected: Detection of Aging Effects (Element 4)

1. NUREG-2191, as modified by SLR-ISG-2021-02-MECHANICAL, states that opportunistic inspections can be performed in lieu of periodic inspections, for buried internally lined/ coated fire water system piping provided that through-wall flaws in the piping can be detected through continuous system pressure monitoring. Opportunistic inspections of the cement lining of the buried Keowee fire detection/protection system piping will be performed in lieu of periodic inspections. System pressure monitoring is not an effective means of detecting through-wall flaws in Keowee fire detection/protection system piping.

   Justification for Exception 1

   The Keowee fire detection/protection system pressure and normal system loads are supplied by the static head between Lake Keowee level and elevation of the fire suppression equipment. A flow switch is installed upstream of the buried cement lined ductile iron piping. This flow switch provides an auto-start signal to the pump if flow greater than ten gallons per minute is detected. Start of the fire protection pump is indicated in the control room such that any significant leak of buried system piping would be immediately detected. In a typical fire protection system, header pressure is maintained by a jockey pump. A leak in excess of jockey pump capacity would result in decreased header pressure which would provide indication of a leak. A typical jockey pump in nuclear station fire protection system has a capacity on the order of 50 gallons per minute. As such, the alternate leak detection method utilized for the Keowee fire detection/protection system is more sensitive than the recommended method. Flow testing and internal piping inspections of the Keowee fire detection/protection system will occur at intervals specified in NFPA 25, or as modified by AMP XI.M27, Table XI.M27-1 and Oconee OE is acceptable (i.e., no leaks due to age-related degradation of cement lining used in buried in-scope fire water system components).

Exception 2 to NUREG-2191

Program Element Affected: Corrective Actions (Element 7)

2. NUREG 2191 recommends that coatings/linings that do not meet acceptance criteria are repaired, replaced, or completely removed. If degradation is identified, the emergency feedwater pump turbine lubricating oil tank internal coating will not be repaired, replaced, or completely removed.

   Justification for Exception 2

   Lessons learned and improved maintenance practices for similar turbines have been communicated at industry meetings facilitated by Nuclear Maintenance Application Center's terry turbine users group and are incorporated in the applicable EPRI maintenance guides. Industry best practice for maintenance of internal coatings applied to turbine oil systems is to remove any damaged coating and not attempt to recoat the surfaces. Defective, damaged, or degraded coating on the emergency feedwater pump turbine lubricating oil tank will be removed but the internal surface will not be repaired or replaced. Removal of the coating will ensure flow blockage will not occur. Periodic inspections of the emergency feedwater pump turbine lubricating oil tanks will continue to be performed to monitor the condition of the internal coating, remove any loose or degraded coating, and monitor the condition of the base metal.

   The NRC approved a GALL exception based on very similar justification as documented in the SER related to the LR of Fermi 2, Docket No. 50-341, July 2016 (ADAMS Accession Number ML16190A241) and in the SER related to the SLR of Peach Bottom Atomic Power Station Units 2 and 3, Docket Nos. DPR 44 and DPR 56, October 2019 (ADAMS Accession Number ML19280D820).

Enhancements

None

Operating Experience

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* AMP will be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO.

1. In September 2019 a self-assessment was performed to verify the regulatory compliance and on-going effectiveness of selected LR AMPs and the overall LR program. Implementation of the borated water storage tank coatings inspection (UFSAR Section 18.3.17.1) and condenser circulating water system internal coatings inspection (UFSAR Section 18.3.17.5) was evaluated as part of this self-assessment. This review confirmed that internal coating inspection aging management activities are being performed in accordance with commitments made during the initial LR process. Summaries of recent

internal inspections of the condenser circulating water system and borated water storage tanks are provided in OE examples 2 and 3, respectively.

An area for improvement was identified related to the condenser circulating water system internal coatings inspection. The results of internal inspections of the condenser circulating water system piping is intended to serve as representative of other buried piping systems within the scope of LR at Oconee. The self-assessment identified that there was insufficient guidance in program documentation to ensure that appropriate evaluation of extent of condition is performed if unacceptable degradation is identified. This issue was entered into the corrective action program and program documentation has been revised to include guidance to perform extent of condition evaluations if inspection results are unacceptable.

OE example 1 provides objective evidence that aging management activities have been implemented in accordance with initial LR commitments and that self-assessments are used to identify and implement programmatic improvements.

2. The internally coated condenser circulating water system intake piping has been visually inspected at least once every five years. All accessible internal surfaces are assessed during physical walkdowns of the piping. The inspection reports from the previous ten years have been reviewed and each have concluded that no conditions existed that would prevent the piping from performing its intended functions through the next scheduled inspection. The results of the inspections for each unit are summarized below.

Unit 1: Inspections of the internal coating of the Unit 1 condenser circulating water system intake piping were performed during the Spring 2011, Fall 2014, and Fall 2018 refueling outages. Generally, the internal coating was found to be in good overall condition with localized areas of rust blooms and nodules. During the Fall 2014 outage, three small areas of coating delamination were identified. These areas were re-inspected during the Fall 2016 and Fall 2018 refueling outage and determined to be acceptable for continued service. Three additional small areas of delamination were identified during the Fall 2018 refueling outage and are planned for repair during the next opportunity when the condenser circulating water system intake piping is drained.

Unit 2: Inspections of the internal coating of the Unit 2 condenser circulating water system intake piping were performed during the Fall 2013 and 2015 refueling outages. Portions of the intake piping could not be inspected during the Fall 2013 refueling outage due to leak-by of isolation valves preventing complete de-watering of the pipe and due to resource and time restraints. During each of these inspections the coating was found to be in overall good condition with localized areas of rust blooms and nodules. No areas of previously unidentified degradation requiring immediate repair were identified during these inspections. Work orders were created following each inspection to perform repairs of identified coating issues at the next opportunity. These repairs have been completed or are scheduled to be completed during the next outage when the piping is de-watered.

Unit 3: Inspections of the internal coating of the Unit 3 condenser circulating water system intake piping were performed during the Spring 2012, Spring 2016, and Spring 2018 refueling outages. During each of these inspections the coating was found to be in overall good condition with localized areas of rust blooms and nodules. No areas of previously unidentified degradation requiring immediate repair were identified during these inspections. Previously identified coating issues were repaired during the Spring 2016 refueling outage. Three small areas of coating delamination were identified during the Spring 2016 refueling outage and subsequently repaired during the Spring 2018 refueling outage as well as numerous other localized areas of concern. All other previously identified areas of degraded coating were re-inspected during the Spring 2018 refueling outage and determined to be acceptable for service until the next scheduled inspection. New areas of localized coating degradation identified in 2018 have been scheduled for re-inspection or repair during the next refueling outage when the piping is de-watered.

OE example 2 provides objective evidence that visual inspections of the internal coating of the condenser circulating water system have successfully identified indications of coating degradation and that appropriate corrective actions are being taken, including re-inspection and repair of degraded coatings, to ensure system intended functions are maintained.

3. The internally coated borated water storage tanks are visually inspected at least once every six years. All accessible internal surfaces are assessed during physical walkdowns of the tanks. The inspection reports from the previous ten years have been reviewed and each have concluded that no conditions existed that would prevent each tank from performing its intended functions through the next scheduled inspection. The results of the inspections for each unit are summarized below.

   Unit 1 – The internal coating of the Unit 1 borated water storage tank was visually inspected during the Fall 2014 refueling outage. During this evolution, wall thickness measurements of the tank bottom were also planned but were unable to be completed so the tank was entered again during the Fall 2016 outage allowing for a second internal visual inspection. The overall condition of the internal coating was very good. Small blisters were identified in areas that had been previously repaired, but they were intact and there was no indication of a breach in the coating. No change in the condition of the coating was noted between the Fall 2014 and Fall 2016 inspections.

   Unit 2 – The internal coating of the Unit 2 borated water storage tank was visually inspected during the Fall 2011 refueling outage. The overall condition of the internal coating was very good. Small blisters were identified in areas that had been previously repaired, but they were intact and there was no indication of a breach in the coating. Two areas of coating degradation identified during the previous inspection completed during the Spring 2007 refueling outage were repaired. Two other small areas of degraded coating that had not been previously identified were also repaired. The internal coating of the tank was re-inspected during the Fall 2016 refueling outage, including areas of concern previously identified. Six areas of degraded coating were identified by engineering and repaired during the Fall 2016 refueling outage.

   Unit 3 – The internal coating of the Unit 3 borated water storage tank was visually inspected during the Fall 2010 refueling outage. The overall condition of the tank coating was very good. Areas that had previously been repaired were inspected and no issues were identified. The previous inspection report from 2006 identified a small area of exposed metal where slight surface rust was occurring. This area was re-inspected in Fall 2010 and no significant change in condition had occurred from the previous inspection. The surface rust in this area was determined to be very minor in nature and acceptable for continued service. Small areas of rust staining were identified at the bottom of two pipe penetrations and attributed to rust from the penetration itself and not due to corrosion of the tank wall. The internal coating of the tank was re-inspected during the Fall 2016 refueling outage, including areas of concern previously identified and found to be acceptable for continued service. No coating repairs were performed in 2016.

OE example 3 provides objective evidence that visual inspections of the internal coating of the borated water storage tanks have successfully identified indications of coating degradation and that appropriate corrective actions are being taken, including re-inspection and repair of degraded coatings, to ensure system intended functions are maintained.

4. Periodic internal visual inspections of the 36 total main condenser waterboxes for the three Oconee operating units are performed during each refueling outage. These inspections have identified varying degrees of degradation of the original coal tar epoxy coating. The walls inside the waterboxes, including the tubesheet, have been observed to have rust blooms, nodules, and degraded sections of coating. A small amount of material loss from the walls in various forms of pitting, scaling, and flaking has been experienced. Though degradation observed to date has not adversely affected main condenser operation or challenged the intended function of the waterboxes, engineering recommended that the internal coatings in all three units be repaired. A project has been developed to fully re-coat both the inlet and outlet waterboxes, including tubesheets, for all three Oconee operating units. The project involves replacing the original coal tar epoxy coating with a Plastocor epoxy coating system. To date, re-coating activities have been completed for ten of the 36 total waterboxes. The remaining waterboxes are scheduled to be re-coated during upcoming outages with all re-coating activities planned for completion by 2026.

   This OE example provides objective evidence that ongoing periodic visual inspections have been successful in detecting and monitoring coating degradation to allow for the scheduling and performance of coating repairs prior to impact on component intended functions.

5. Inspections of the emergency feedwater pump turbine oil tanks have historically identified peeling and flaking of the manufacturer applied internal coating. This is a generic issue for similar turbine oil reservoirs across the industry. Industry best practice, as documented in EPRI turbine maintenance guides, is to remove any degraded coating to prevent potential performance issues due to the presence of foreign material but not to attempt to recoat the internal surface. The results of inspections from the previous ten years were reviewed during the development of this AMP. No evidence of ongoing coating degradation or significant corrosion were identified during the 15 inspections of the internal surface of the three emergency feedwater pump turbine oil tanks performed over the previous ten years.

> This OE example provides objective evidence that the remaining sound coating is stable and that maintenance activities at Oconee have been successful at mitigating the potential impact on turbine performance from degraded coating in the emergency feedwater pump turbine oil tanks.

The above examples of OE provide objective evidence that the aging management activities and methods to be implemented by the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

<u>Conclusion</u>

The implementation of the *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.28 ASME XI, SUBSECTION IWE

Program Description

The *ASME Section XI, Subsection IWE* AMP is an existing condition monitoring program that manages cracking, loss of material, loss of sealing, loss of preload, and loss of leak tightness by providing aging management of the steel liner of the concrete containment. ASME Code, Section XI, Subsection IWE inspections are performed in order to identify and manage containment liner aging effects that could result in loss of intended function for the SPEO. Included in this inspection program are the containment liner plate and its integral attachments, containment penetrations, containment hatches, airlocks, and pressure retaining bolting.

Surface and volumetric examinations are performed to identify indications of degradation. The primary inspection method is visual examination (general visual, VT-1, VT-3) of surfaces for evidence of cracking, discoloration, wear, pitting, excessive corrosion, arc strikes, gouges, surface discontinuities, dents, and other signs of surface irregularities, including discernible liner plate bulges. Limited volumetric examinations (ultrasonic thickness measurement) and surface examinations (e.g., liquid penetrant) are performed, as required. Plant OE has not identified any discernible bulges requiring further examination. Acceptance criteria, corrective actions, and expansion of the inspection scope when degradation exceeding the acceptance criteria is found are in accordance with ASME Code, Section XI, Subsection IWE, Article IWE 3000.

For the third containment inspection interval, beginning during the third quarter of 2014, IWE Containment inservice inspections are performed in accordance with the 2007 Edition of ASME Code, Section XI, Subsection IWE (through the 2008 addenda), supplemented with the applicable requirements of 10 CFR 50.55a(b)(2)(ix). Prior to the end of each interval, the IWE Program Plan is revised to reflect the appropriate update of ASME Code, Section XI, consistent with the provisions of 10 CFR 50.55a.

Containment seals and gaskets are included in the scope of the *10 CFR Part 50, Appendix J* (B2.1.31) AMP. Service Level 1 coatings are included in the scope of the *Protective Coating Monitoring and Maintenance* (B2.1.35) AMP.

Procedures will include preventive actions to ensure bolting integrity for replacement and maintenance activities by specifying proper selection of bolting material and lubricants, and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high strength bolting. For structural bolting consisting of ASTM A325, ASTM A490, ASTM F1852 and/or ASTM F2280 bolts, the preventive actions for storage, lubricant selection, and bolting and coating material selection discussed in Section 2 of the Research Council for Structural Connections publication, *"Specification for Structural Joints Using High-Strength Bolts,"* will be used.

There are no stainless steel penetration bellows installed as part of the containment pressure boundary. Stainless steel high energy pipes that penetrate the containment are connected to carbon steel penetration sleeves with dissimilar metal welds. Plant OE has not identified any stress corrosion cracking associated with these welds. The *10 CFR Part 50, Appendix J* AMP manages the aging of these dissimilar metal welds. The containment steel liner and penetrations were analyzed for cyclic fatigue and do not require surface examinations in addition to visual examinations. This evaluation is a TLAA and the projected number of cycles is less than the design cycles for 80 years. Therefore, cracking due to fatigue is managed as a TLAA. A one-time volumetric examination of metal liner surfaces that are inaccessible from one side will be performed if triggered by plant-specific OE. This supplemental volumetric examination consists of a sample of one-foot square locations that include both randomly selected and focused areas most likely to experience degradation based on OE and/or relevant considerations such as environment.

The *ASME Section XI, Subsection IWE* AMP manages aging of the steel liner of the concrete containment building. An evaluation of the acceptability of the inaccessible areas is completed whenever conditions are detected in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas.

NUREG-2191 Consistency

The *ASME Section XI, Subsection IWE* AMP will be consistent with the recommendations provided in Section XI.S1 of NUREG-2191 with the enhancements as described below.

Exception to NUREG-2191

None

Enhancements

The following enhancements will be implemented in the following program elements: Preventive Actions (Element 2), Parameters Monitored or Inspected (Element 3), and Detection of Aging Effects (Element 4).

1. The program will be enhanced to specify that for “high strength” structural bolting consisting of ASTM A325, ASTM F1852, and/or ASTM A490 bolts, the preventative actions for storage, lubrication, and stress corrosion cracking potential discussed in Section 2.0 of Research Council for Structural Connections publication *“Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts,”* will be used. (Element 2)

2. The program will be enhanced to include inspection attributes for the aging mechanisms listed in NUREG-2191. For non-coated surfaces this includes evidence of cracking, discoloration, wear, pitting, excessive corrosion, arc strikes, gouges, surface discontinuities, dents, and other signs of surface irregularities including discernible liner plate bulges. For painted or coated surfaces this includes evidence of flaking, blistering, peeling, discoloration, and other signs of potential distress of the underlying metal shell or liner system, including discernible liner plate bulges. (Element 3)

3. The program will be enhanced to specify a one-time volumetric examination of metal liner surfaces that are inaccessible from one side if triggered by plant-specific OE. The trigger for this supplemental examination is plant-specific occurrence or recurrence of measurable metal liner corrosion (base metal material loss exceeding 10% of nominal plate thickness) initiated on the inaccessible side or areas, identified since the date of

issuance of the first renewed license. This supplemental volumetric examination consists of a sample of one-foot square locations that include both randomly-selected and focused areas most likely to experience degradation based on operating experience and/or other relevant considerations such as environment. The supplemental volumetric examinations for each unit will occur within two refueling outages after identifying the trigger for the examination. Any identified degradation is addressed in accordance with the applicable provisions of the ASME Section XI, Subsection IWE program. The sample size, locations, and any needed scope expansion (based on findings) for this one-time set of volumetric examinations should be determined on a plant-specific basis to demonstrate statistically with 95 percent confidence that 95 percent of the accessible portion of the containment liner is not experiencing corrosion degradation with greater than 10 percent loss of nominal thickness. (Element 4)

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *ASME Section XI, Subsection IWE* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In 2018, the NRC performed a walkdown of the Oconee Unit 3 reactor building and questioned if the containment leak chase channel piping that is embedded in the basement floor is inspected as part of the containment ISI program, specifically ASME Section XI, Article IWE Item E1.30, *Moisture Barriers*. Per the ASME Code, moisture barrier exams shall include moisture barrier materials intended to prevent intrusion of moisture against inaccessible areas of the pressure retaining metal containment shell or liner at concrete to metal interfaces which are not seal-welded. The NRC identified that failure to inspect the leak chase channel piping as a part of IWE Item E1.30 is a potential performance deficiency.

   A corrective action item was generated to perform inspections of piping penetrations and the liner in areas of concern. Tasks were also generated to inspect and repair coatings at the piping penetrations, and to inspect and repair the moisture barrier as needed. Two indications were noted in the liner plate and determined not to require repair. An indication in the moisture barrier was identified and was repaired. Actions were taken to update the containment ISI plan to include these specific areas for visual inspection.

   OE example 1 provides objective evidence that age-related inspection findings or concerns are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct deficiencies.

2. In 2018, a containment ISI examination of the containment liner plate identified an area of wall loss greater than 10% of the nominal liner plate thickness. This is a relevant condition as defined by Section IWE-3522 of the Section XI Code, and requires engineering evaluation for acceptance for continued service. The exam was initially performed by ultrasonic testing and the lowest thickness found was well within the

acceptable range. However, pit gauge readings in this area found pits with depths that would result in wall thicknesses marginally less than 90% of the nominal thickness. Follow up actions under the corrective action program included evaluation of the liner for continued service, re-coating the liner plate, restoration of the moisture barrier, evaluation of extent of condition, and initiation of augmented examinations of the moisture barrier under the containment ISI Program.

OE example 2 demonstrates that inspections of containment components are being performed in accordance with industry guidelines and that those inspections are effective in identifying aging effects prior to loss of intended function. OE example 2 also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and to monitor and trend the conditions.

3. An inspection of the containment moisture barrier was performed in 2020 as required by ASME Section XI, Subsection IWE. The examination identified relevant indications of the moisture barrier such as wear, damage, surface cracks, and lack of adhesion that could permit intrusion of moisture against inaccessible areas of pressure retaining surfaces of the metal containment liner. The evaluation determined that all areas of the moisture barrier should be subject to repair and re-inspection. Follow up corrective actions included the implementation of inspection and repair activities for all accessible areas of the moisture barrier. Several inaccessible areas were identified; each of these were inspected to ensure no signs of corrosion or staining was present. Actions were also taken to update the containment ISI plan to document these inaccessible areas and address in future examinations.

   OE example 3 provides objective evidence that program inspections, along with the corrective action program, will effectively monitor in scope SSCs to assure that these components will continue to perform their intended functions, and that appropriate aging management will be performed during the SPEO.

4. OE affirms Oconee awareness of the need to evaluate internal and external events for relevance, and to incorporate updates as appropriate to ensure program effectiveness.

   - An item was entered into the corrective action program in 2013 to document a potential issue raised by NRC inspectors while reviewing an engineering change package related to in-service containment liner inspection ports for a US pressurized water reactor facility. NRC inspectors challenged the plant's position on the definition of "inaccessible" as it relates to certain portions of the containment liner that are not inspected. A corrective action was initiated to require a follow up investigation, which determined that Oconee does not have areas that are bolted and glued like those described in the engineering change package for the other facility.
   - An item was entered into the corrective action program in 2014 to document Oconee review of industry OE, where a hole was identified in the containment liner plate at another pressurized water reactor facility. Investigation and laboratory analysis by that utility determined that there were indications of two through wall penetrations with a possible third penetration slightly off-set from the second. After cleaning the area and removal of the corrosion products, a hole initially determined to be approximately 0.40" x 0.28" in size was discovered in the containment steel liner plate. The direct

cause of this industry event was pitting type corrosion, originating from foreign material introduced during the original construction of the containment wall. The Oconee evaluation of this item concluded that Oconee performs liner plate inspections that are capable of detecting degradation of this nature, and that no such degradation had been identified at Oconee.

OE example 4 provides evidence Oconee has recognized the importance of addressing external OE. OE example 4 also demonstrates that Oconee is performing required ISI examinations, consistent with the requirements of ASME Section XI, Subsection IWE. Oconee OE demonstrates that the corrective action program is utilized to document and resolve items that do not meet acceptance criteria, or when unexpected or abnormal conditions are observed. The OE also reflects the involvement of engineering to evaluate and disposition degradation and anomalous conditions to ensure that intended functions are maintained, and that updates to program activities are implemented as necessary to ensure ongoing program effectiveness.

5. In September 2020, an AMP effectiveness review was performed for the *ASME Section XI Containment Inservice Inspection* program. The subject ONS program aging management activities were evaluated against the performance criteria identified in NEI 14-12, "Aging Management Program Effectiveness". The effectiveness reviews included the IWE and IWL aspects of the Containment Inservice Inspection program. The review concluded that both programs are meeting the requirements of NEI 14-12. No gaps were identified during these effectiveness reviews.

   OE example 5 provides objective evidence that the current *ASME Section XI Containment Inservice Inspection* program is effectively managing aging and meeting all current LR commitments. This provides reasonable assurance that ongoing program effectiveness will continue in the SPEO.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *ASME Section XI, Subsection IWE* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *ASME Section XI, Subsection IWE* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

<u>Conclusion</u>

The implementation of the *ASME Section XI, Subsection IWE* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects and mechanisms will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.29 ASME XI, SUBSECTION IWL

Program Description

The *ASME Section XI, Subsection IWL* AMP is an existing condition monitoring program that manages the following aging effects for containment concrete:

- Cracking
- Loss of material and loss of material (spalling, scaling)
- Distortion
- Loss of bond
- Increase in porosity and permeability

For the current ten year inspection interval (starting 7/15/2014 and going through 7/2024), IWL containment inservice inspections are performed consistent with the 2007 Edition of ASME Code, Section XI, Subsection IWL (including 2008 addenda), supplemented with the applicable requirements of 10 CFR 50.55a(b)(2). In conformance with 10 CFR 50.55a(g)(4)(ii), the *Containment Inservice Inspection* program will be updated during each successive 120 month inspection interval to comply with the requirements of the latest edition and addenda of the code specified 12 months before the start of the inspection interval.

The program includes the accessible areas of the concrete dome and cylinder walls. The evaluations of these accessible areas provide the basis for extrapolation to the expected condition of inaccessible areas, and an assessment of potential degradation in such areas. The primary inspection method is visual examination (VT-1C, VT-3C) using the evaluation criteria provided in Chapter 5 of ACI 349.3R-02, *"Evaluation of Existing Nuclear Safety-Related Concrete Structures."* Photography and its variations may be used to trend aging effects such as cracking, spalling, delamination, pop-outs, or other age-related concrete degradation as illustrated in ACI 201.1R-1968, *"Guide for Conducting a Visual Inspection of Concrete in service."*

Tendon wires and tendon anchorage hardware surfaces are inspected for loss of material, cracking, and mechanical damage. The tendon corrosion protection medium is tested for pH, presence of free water, and soluble ion concentration.

The *ASME Section XI, Subsection IWL* AMP tests selected sample tendons for yield strength, ultimate tensile strength, and elongation. The sample includes hoop tendons, vertical tendons and dome tendons. The frequency of tendon inspections is consistent with IWL-2421 for sites with multiple units. The assessment and trending of measured tendon prestressing forces will be managed by the program.

Additionally, inaccessible areas of the Oconee reinforced containment concrete structure, such as the dome, wall, basemat, ring girders and buttresses, are managed by the *ASME Section XI, Subsection IWL* AMP, supplemented by the *Structures Monitoring* (B2.1.33) program. Steel liners for the concrete containments, and their integral attachments, are included within the scope of the *ASME Section XI, Subsection IWE* (B2.1.28) program.

NUREG-2191 Consistency

The *ASME Section XI, Subsection IWL* program is an existing program that will be consistent with the ten elements of AMP XI.S2, *ASME Section XI, Subsection IWL*, specified in NUREG-2191 (GALL-SLR) with enhancements and exceptions described below.

Exception to NUREG-2191

Program Element Affected: Acceptance Criteria (Element 6)

1. The predicted lower limit values were developed based upon the original design criteria and CLB for the tendons. These criteria consider the same factors, but are not in complete accordance with RG 1.35.1 for determining predicted lower limit values. During development of the graphs, prestress losses resulting from elastic shortening were computed for each tendon group and not individually as prescribed in RG 1.35.1. The predicted lower limit curves represent the average values for each tendon group.

   Justification for Exception 1 to NUREG-2191:

   In a safety evaluation dated September 15, 1997, the NRC approved changing the tendon surveillance program by adoption of RG 1.35, Revision 3 methodology which included guidance in RG 1.35.1 for establishing prescribed lower limits and minimum required values for tendon groups. This approach was also approved for LR In NUREG-1723 and will be continued throughout SPEO.

Enhancements

The following enhancements will be implemented in the following program elements: Parameters Monitored or Inspected (Element 3), and Monitoring and Trending (Element 5)

1. The program will be enhanced to incorporate monitoring for changes in material properties of increase in porosity and permeability, and loss of strength and pattern cracking with darkened edges. (Element 3)

2. The program will be enhanced to specify that inspection results are documented and compared to previous results to identify changes from prior inspections. (Element 5)

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *ASME Section XI, Subsection IWL* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In 2011, NRC Information Notice 11-20, *"Concrete Degradation by Alkali-Silica Reaction (ASR)"* was reviewed to determine if additional actions were required. The review identified that the scope of the inspections of concrete structures includes evidence of patterned cracking indicative of alkali-silica reaction. There has been no visual evidence/ patterned cracking indicative of alkali-silica reaction on the exterior of any Oconee concrete structures that are exposed to water, except the Keowee spillway wing walls, which have shown evidence of small amounts of expansion in the past. Since 2005, frequent monitoring of the Keowee spillway wing walls has taken place to document and trend the inward expansion of these walls. It was ultimately concluded by testing of the Keowee spillway wing walls that alkali-silica reaction was the contributing cause of this expansion, however, wall movements were very small and posed no significant risk to the structural integrity of the walls. There was no visual evidence of alkali-silica reaction at the Keowee spillway wing walls. As a result of the experience at Keowee, those at Oconee who perform structures monitoring inspections of concrete are familiar with alkali-silica reaction.

   OE example 1 provides objective evidence that industry OE is reviewed for applicable aging effects, and appropriate actions are included in aging management programs. This example also illustrates how program inspections, effectively monitor in scope SSCs to assure that these components will continue to perform their intended functions, and that appropriate aging management will be performed during the subsequent period of extended operation.

2. During the regularly scheduled ASME Code Section XI, Subsection IWL concrete surface examination of the Oconee Unit 1 reactor building in 2012, it was reported that superficial cracks had been observed in the containment dome. The cracks were in a circumferential pattern, following the curvature of the dome, and about 12" apart. The cracks appeared to follow the circumferential rebar placed in the dome during construction, and were determined to exceed the maximum 0.010" width below which no further evaluation is required in accordance with ASME Code Section XI, Subsection IWL, IWL-3221.3(d). Exposed rebar was also discovered and was painted to inhibit rust. The IWL responsible engineer subsequently evaluated the cracking, and concluded that there was no loss of functional capacity associated with this condition. The evaluation recognized that long term effects could include water exposure to the rebar causing rebar expansion and spalling of concrete, and recommended a long-term plan be developed for coating or weatherizing the remaining surface of the dome and protecting the exposed rebar. Follow up actions under the corrective action program included the installation of a protective coating system, as well as a task for subsequent coating inspections.

   OE example 2 demonstrates that inspections of accessible areas of the concrete dome are being performed in accordance with industry guidelines and that those inspections are effective in identifying aging effects prior to loss of intended function. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and to monitor and trend the conditions.

3. In December of 2012, while performing temperature readings at the Unit 1 main steam penetration inside of the enclosed penetration area, it was discovered that the maximum inner surface of the concrete around the piping at the penetration was 227^{o}F. The main

steam penetration configuration is shown in UFSAR Figure 3-20. The concrete cylinder at the main steam penetration is 3’-9” thick. The temperature found exceeds the limit set forth in Subsection CC-3440 of ASME Code Section III, Division 2. The issue was entered into the corrective action program. Subsection CC-3440 of ASME Code Section III, Division 2 states higher temperatures than 150°F for general areas and 200°F for local areas may be allowed in the concrete if tests are provided to evaluate the reduction in strength and this reduction in strength is applied to the allowable strength considered in the design. Also, evidence shall be provided which verifies that the increased temperatures do not cause deterioration of the concrete either with or without load.

The concrete temperatures were not uniform around the penetration and were hotter above the penetration than below the penetration, with no values exceeding the 200°F limit being below the penetration and did not exceed the 200°F limit beyond about 4 feet from the edge of the penetration.

Subsequently, nondestructive testing of the exterior Unit 1 reactor building concrete wall, was performed in February of 2013. The testing was performed to evaluate the condition of the concrete immediately around the penetration. The spectral analysis of surface waves nondestructive testing is a volumetric testing method that was utilized during the investigation. The spectral analysis of surface waves test method involves determining the relationships between the wavelength and velocity of different surface vibrations as the vibration frequency is varied and is an indication of concrete condition and strength of the concrete throughout the depth of the structure (as described in ACI 228.2R, “*Nondestructive Test Methods for Evaluation of Concrete in Structures”*, Section 2.2.4). The spectral analysis of surface waves test results indicate that all of the test locations have data within the typical range of sound structural concrete. Additionally, the test areas were visually inspected by the engineering consultant to look for any indications that the concrete had reached damaging temperatures. There were no indications of color changes to the concrete to a light pink or buff color, which is typical in fire damage cases and is a visual indication of degradation. The concrete was also sounded to assess if the surface hardness of the concrete had degraded or become brittle relative to areas away from the penetration. These sounding techniques showed no indication of significant concrete degradation. The investigation concluded that there was no significant damage to the concrete immediately surrounding the penetration. Therefore, there is no reduction in strength to be considered in the design.

OE example 3 provides objective evidence that the existing AMP activities are being effectively implemented to identify and manage aging effects of in scope components and that the results of inspection activities are used to inform and enhance the program. Deficiencies identified during inspection activities are entered into the corrective action program and appropriate corrective actions are taken to evaluate and address deficiencies.

4. During Unit 1 tendon surveillances in 2016, lift-off examinations were performed on either end of a selected tendon. This is an augmented examination associated with repair and replacement activities during steam generator replacement activities, required in accordance with IWL-2521.2. In the lift-off exam for end 1 of the tendon, the maximum

ram pressure was achieved without successful liftoff. The liftoff of end 2 of the tendon was subsequently performed, and liftoff was achieved at a value less than the minimum required value, less than the predicted lower limit, and significantly lower than end 1. The condition was referred to the corrective action program, which directed that lift-off testing be repeated. During the repeat lift-off test, the tendon successfully met the acceptance criteria. Based on the retest, it was concluded there was a discrepancy in the performance and documentation of the initial test.

OE example 4 provides objective evidence that program inspections, along with the corrective action program, will effectively monitor in scope SSCs to assure that these components will continue to perform their intended functions, and that appropriate aging management will be performed during the SPEO.

5. An item was entered into the corrective action program in 2016 which documents that spalled concrete was observed at the top of each of the 6 hoop tendon buttresses during Unit 1 containment ISI examinations. This noted condition was similar to that which had previously been observed and repaired on the other Oconee units. It was determined that a grout repair should be implemented by the end of the next Unit 1 Containment ISI surveillance, as some locations are not easily accessible at full power operation and the repair is dependent on the power scaffolding being in place with a crane operator present. Corrective actions included the initiation of a work order to accomplish the required repairs which were completed in 2020.

   OE example 5 demonstrates that inspections of accessible areas of containment cylinder walls are being performed in accordance with industry guidelines and that those inspections are effective in identifying aging effects prior to loss of intended function. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and to correct deficiencies.

6. In September 2020, an AMP effectiveness review was performed for the *ASME Section XI Containment Inservice Inspection* Program. The subject ONS program aging management activities were evaluated against the performance criteria identified in NEI 14-12, "Aging Management Program Effectiveness". The effectiveness reviews included the IWE and IWL aspects of the *ASME Section XI Containment Inservice Inspection* program. The review concluded that both programs are meeting the requirements of NEI 14-12. No gaps were identified during these effectiveness reviews.

   OE example 6 provides objective evidence that the current Containment Inservice Inspection program is effectively managing aging and meeting all current license renewal commitments. This provides reasonable assurance that ongoing program effectiveness will continue in the subsequent period of operation

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *ASME Section XI, Subsection IWL* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, re-evaluation, repairs, or replacements is provided for locations where aging effects are found.

Periodic assessments of the *ASME Section XI, Subsection IWL* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *ASME Section XI, Subsection IWL* AMP, with the noted enhancements, provides reasonable assurance that the identified aging effects and mechanisms will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.30 ASME XI, SUBSECTION IWF

Program Description

The *ASME Section XI, Subsection IWF* AMP is an existing condition monitoring program that manages loss of material, cracking, loss of preload, and loss of mechanical function for supports of Class 1, 2, and 3 piping components.

During the fifth ISI interval (July 2014 to July 2024), inspections of supports for Class 1, 2, and 3 piping and components are performed consistent with 2007 Edition of the ASME Code Section XI through the 2008 Addenda, as approved in 10 CFR 50.55a. In conformance with 10 CFR 50.55a(g)(4)(ii), the ISI program is updated during each successive 120 month inspection interval to comply with the requirements of the latest edition and addenda of the code specified twelve months before the start of the inspection interval. ASME Code edition will be used consistent with the provisions of 10 CFR 50.55a during the SPEO.

Supports for Class 1, 2, and 3 piping and component supports are selected for examination per the requirements of ASME Code, Section XI, Subsection IWF. Acceptance standards are specified in ASME Code, Section XI, Subsection IWF, Article IWF-3400. If a component support does not meet the acceptance standards of IWF-3400 but is electively repaired to as new condition, the sample is increased or modified to include another support that is representative of the remaining population of supports that were not repaired. The scope of the inspection for supports is based on class and total population as defined in Table IWF-2500-1. The primary inspection method employed is visual examination. Inspections that reveal indications or relevant conditions that are unacceptable are entered in the corrective action program.

The requirements of subsection IWF are supplemented to include monitoring of high-strength bolting (actual measured yield strength greater than or equal to 150 ksi or 1,034 MPa and greater than one inch nominal diameter), with volumetric examination comparable to that of ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1 to detect cracking in addition to the VT-3 examination. In each ten year period during the SPEO, a representative sample of bolts will be inspected. The sample will be 20% of the population (for a material/environment combination) up to a maximum of 17 bolts.

Procedures will include preventive actions to ensure bolting integrity for replacement and maintenance activities by specifying proper selection of bolting material and lubricants, and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high-strength bolting. For structural bolting consisting of ASTM A325, ASTM A490, ASTM F1852 and/or ASTM F2280 bolts, the preventive actions for storage, lubricant selection, and bolting and coating material selection discussed in Section 2 of the Research Council for Structural Connections publication, "*Specification for Structural Joints Using High-Strength Bolts*," will be used.

This program includes a one-time inspection within five years prior to entering the SPEO of an additional 5% of the sample populations for Class 1, 2, and 3 piping supports. The additional supports will be selected from the remaining population of IWF piping supports and will include components that are most susceptible to age related degradation.

NUREG-2191 Consistency

The ONS *ASME Section XI, Subsection IWF* AMP is an existing program that will be consistent with the ten elements of AMP XI.S3, *ASME Section XI, Subsection IWF*, specified in NUREG-2191 (GALL-SLR) with enhancements described below.

Exception to NUREG-2191

None

Enhancements

The following enhancements will be implemented in the following program elements: Scope of Program (Element 1), Preventive Actions (Element 2), Detection of Aging Effects (Element 4), and Monitoring and Trending (Element 5):

1. Perform periodic evaluations of the acceptability of inaccessible areas of supports (e.g., portions of supports encased in concrete, buried underground, or encapsulated by guard pipe), when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas of supports. Perform these evaluations once every ten years during the SPEO. (Element 1).

2. Procedures will be revised to specify that for structural bolting consisting of ASTM A325, ASTMF1852, and/or ASTM A490, the preventative actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of Research Council for Structural Connections publication, "*Specification for Structural Joints Using ASTM A325 or A490 Bolts*," will be used (Element 2).

3. Procedures will be revised to specify that whenever replacement of bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants will be in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339 (Element 2).

4. Perform a one time inspection within five years prior to entering the SPEO of an additional 5% of the sample populations for Class 1, 2, and 3 piping supports. The additional supports will be selected from the remaining population of IWF piping supports and will include components that are most susceptible to age related degradation (Element 4).

5. Procedures will be revised to specify that, for NSSS component supports, high-strength bolting greater than one-inch nominal diameter, volumetric examination comparable to that of ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1 will be performed to detect cracking in addition to the VT-3 examination. In each ten year period during the SPEO, a representative sample of bolts will be inspected. The sample of high-strength bolting greater than one-inch nominal diameter subject to volumetric examination will consist of 17 bolts per unit. The sample shall include the bolting that is

most susceptible to age-related degradation (i.e., based on time in service, aggressive environment, etc.) (Element 4).

6. If a component does not exceed the acceptance standards of IWF-3400 but is repaired to as-new condition, the sample is increased or modified to include another support that is representative of the remaining population of supports that were not repaired (Element 5).

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *ASME Section XI, Subsection IWF* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In November of 2012, during regularly scheduled ISI, it was discovered that the spacer for a pipe clamp bolt next to a load stud was missing. Spacers are provided to maintain required dimensions and to prevent the bending in the ears of the clamp due to over tightening of the nut. A condition report was initiated in the corrective action program and further evaluation determined that the pipe is bearing on the clamp and the required dimension is maintained. Therefore, the missing spacer was not an operational concern and the clamp continued to perform its intended function. Follow up corrective actions included updating the support sketch to reflect the field condition, as evaluated and determined to be acceptable.

2. In April of 2015, during ASME Section XI VT-3 inspections, a pipe support was found out of tolerance. The pipe support sketch indicated a gap above and below the pipe, and the inspection found the pipe was bearing on the support below, with a gap above. The analytical model for this piping problem was subsequently re-analyzed with the support being restricted in the vertical direction. The results of the analysis indicated that, although piping stresses are within the allowable limits and the support is capable of taking the load, support loads on one of the nearby supports exceeded its capability. Further review indicated that some improvements could be made to the analysis model. Subsequent re-analysis concluded that all piping components are qualified for the faulted condition, such that the piping, hangers, and equipment would not fail, and other equipment is not affected. In summary, the analyses showed that all piping components are qualified for the faulted condition, but not in conformance with the UFSAR. A recommendation was made that the support be declared operable but degraded/non-conforming and assigned a corrective action. The condition was resolved when a design change was implemented to remove the support that was found to be discrepant. An analysis was performed as part of the design change to demonstrate that all piping stresses and support loads were satisfactory as modified.

3. In January of 2016, during an ASME Section XI VT-3 inspection, it was noted that the hanger had an approximate gap of 1/8 inch between the base plate and the wall. A work order was written to add a shim to the top north anchor of the baseplate. During craft inspection in preparation to add the shim, it was discovered that a shim between the base

plate and wall was already in place. The gaps were checked and found to be within tolerance per the specification, but the shim did not meet the requirements of the specification. Upon further review, other bill of material discrepancies were noted on the design drawing. A condition report was initiated in the corrective action program. A corrective action was initiated for engineering to evaluate the significance of the discrepancies. An engineering review determined that the discrepancies are acceptable with no changes required to the hanger and no challenges to operability. An engineering change was implemented to revise the design drawing to match the installed configuration.

4. In November of 2017, while performing ASME Section XI VT-3 inspections, a pipe clamp on a rod hanger was found overtightened. Quality control noted that the tolerance of a specified dimension on the pipe clamp exceeded the value referenced on the design drawing. The item was entered into the corrective action program, and an evaluation of the discrepancy was requested. The evaluation determined that the as found condition to be acceptable. Corrective actions included an assignment to revise the drawing to reflect the acceptability of the field condition.

5. In February of 2018, several discrepancies were identified during the pre-outage visual VT-3 examinations of a variable load spring support. The item was entered into the corrective action program, and appropriate notifications of the condition were made. An engineering evaluation of the information from the inspection and addressed each of the indications identified. The evaluation determined that the saddle’s as found condition is acceptable. Corrective actions included revising the hanger sketch to reflect the as-built condition.

These examples reflect that Oconee is performing required support examinations, consistent with the requirements of ASME Section XI, Subsection IWF. Evidence is provided that inspections are performed by qualified personnel and approved methods, and that these methods are capable of detecting nonconforming conditions and degradation. Evidence is provided that examinations are compared to design conditions to determine acceptability. The corrective action program is utilized to resolve instances where field configuration differs from the design condition, with field corrections or design documents updates initiated as appropriate. Oconee OE demonstrates that the corrective action program is utilized to document and resolve items that do not meet acceptance criteria, or when unexpected or abnormal conditions are observed. The OE also reflects the involvement of engineering to evaluate and disposition degradation and anomalous conditions, and to implement corrective actions as needed to ensure that intended functions are maintained.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *ASME Section XI, Subsection IWF* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *ASME Section XI, Subsection IWF* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *ASME Section XI, Subsection IWF* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects and mechanisms will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.31 10 CFR PART 50 APPENDIX J

Program Description

The *10 CFR Part 50, Appendix J* AMP is an existing performance monitoring program that manages the loss of material, loss of leak tightness, cracking, and loss of bolting preload in the containment and various systems penetrating primary containment. The program also detects loss of sealing due to degradation of elastomer gaskets and seals. The program manages steel and stainless steel containment structural elements, concrete embedments, penetration sleeves, hatches, airlocks, and bolting in indoor uncontrolled air and treated water environments.

The program consists of tests performed in accordance with the regulations and guidance provided in 10 CFR 50, Appendix J, *"Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors,"* Option B; Regulatory Guide 1.163, *"Performance-Based Containment Leak-Test Program,"* and NEI 94-01, *"Industry Guideline for Implementing Performance-Based Options of 10 CFR Part 50, Appendix J,"* and subject to the requirements of 10 CFR Part 54, *"Requirements for Renewal of Operating Licenses for Nuclear Power Plants."*

Containment leak rate tests are performed to ensure that leakage through the containment and systems and components penetrating primary containment does not exceed allowable leakage limits, as specified in the Technical Specifications. An integrated leak rate test and local leak rate tests are performed at intervals that comply with 10 CFR Part 50, Appendix J, Option B.

Visual inspections of the accessible interior and exterior surfaces of the containment structure, performed by the *ASME Section XI, Subsection IWE* (B2.1.28) program and the *ASME Section XI, Subsection IWL* (B2.1.29) program, augment the *10 CFR Part 50, Appendix J* program leakage rate testing and detect evidence of structural degradation that may affect the containment leak rate. These inspections are performed at intervals that comply with 10 CFR Part 50, Appendix J.

Aging effects of containment pressure-retaining boundary components excluded from leak rate testing are managed by the *External Surfaces Monitoring of Mechanical Components* (B2.1.23) program, *One-Time Inspection* (B2.1.20) program, *Water Chemistry* (B2.1.2) program, *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* (B2.1.24) program, *Open-Cycle Cooling Water System* (B2.1.11) program and the *Flow-Accelerated Corrosion* (B2.1.8) program.

Monitoring and trending is performed by comparing valve and penetration leakage from test results to administrative leakage limits that are set lower than the regulatory acceptance criteria. Test or inspection results that do not satisfy established criteria are entered into the corrective action program for evaluation.

NUREG-2191 Consistency

The ONS *10 CFR Part 50, Appendix J* AMP is consistent with the ten elements of AMP XI.S4, *10 CFR Part 50, Appendix J* specified in NUREG-2191.

Exception to NUREG-2191

None

Enhancements

None

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *10 CFR Part 50, Appendix J* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. The following two examples, while not age-related issues, do illustrate the types of actions taken under the current *10 CFR Part 50, Appendix J* program. The first example is from November 2013. The Oconee Unit 2 fuel transfer tube and reactor coolant standby shutdown facility makeup secondary penetration failed its Type C local leak rate test. Leakage was attributed to issues with the spent fuel pool to reactor coolant makeup pump block valve. The leak rate measured during the Type C test was 13,200 standard cubic centimeters per minute. This was above the test acceptance criteria of 443 standard cubic centimeters per minute. At the time of the test, all leakage was determined to be valve seat leakage.

   The cumulative leakage for the Oconee Unit 2 containment, including leakage from this block valve was determined to be 25,631 standard cubic centimeters per minute. The total allowable leakage for the Unit 2 containment is 212,402 standard cubic centimeters per minute ($0.6L_a$) and therefore, the requirements of Tech Spec 3.6.1 were met. A work order was generated and repair was completed.

   The second example is from May 2014. The equivalent Unit 3 valve was tested and exhibited a similar high leak rate (28,700 standard cubic centimeters per minute). The cumulative leakage for the Oconee Unit 3 containment, including this valve, was 48,874 standard cubic centimeters per minute. Engineering and operations evaluated the Oconee Unit 3 leakage against the total allowable leakage of 212,402 standard cubic centimeters per minute ($0.6L_a$) and determined the Unit 3 Containment met the requirements of Tech Spec 3.6.1.

   A cause evaluation was performed on the failed leak rate test for the Unit 3 spent fuel pool to reactor coolant makeup pump block valve. The cause evaluation noted the stem and disc for the valve had been replaced as the result of a 10 CFR Part 21 notification from the manufacturer. The valve disc removed from valve was compared to a new disc from the manufacture and a dimensional difference was noted in the “feet on the bottom of the disc wedge” and affected the disc to seat contact.

The cause evaluation also noted that the Unit 2 block valve experienced excessive seat leakage following the same stem/disc/wedge replacement during the fall of 2013 outage and that the issue applies to all three Oconee units. Work orders were issued for this same block valve on all three units to ensure the proper contact between the valve seat and disc sealing surfaces.

OE example 1 demonstrates that actions taken under the current *10 CFR Part 50, Appendix J* program, including use of the corrective action program ensure appropriate corrective actions are taken to evaluate and correct deficiencies.

2. In April of 2020, Oconee Unit 3 electrical penetration WD-7 was leak rate tested and did not meet the acceptance criteria of 16 standard cubic centimeters per minute. The leakage measured during testing was 30 standard cubic centimeters per minute. A condition report was initiated in the corrective action program. The cumulative leakage for the Oconee Unit 3 containment was evaluated by engineering and operations and found to meet the requirement of Tech Spec 3.6.1. Since the measured leakage is a small contributor to the overall containment leakage rate, it was determined acceptable to repair at a later date and a work order was opened to repair during the next refueling outage.

   OE example 2 demonstrates that the actions under the current *10 CFR Part 50, Appendix J* program, including use of the corrective action program ensure appropriate corrective actions are taken to evaluate and correct deficiencies.

3. In August 2020, a Maintenance Rule (a)(1) evaluation was performed due to three recent Unit 3 leak rate tests failing to meet acceptance criteria and being considered maintenance rule functional failures. The three leak rate tests were for the reactor building auxiliary cooler low pressure service water system supply control valve, reactor building auxiliary cooler low pressure service water system supply block valve, and the normal sump drain/hydrogen re-combiner drains secondary penetration.

   The evaluation identified reactor building auxiliary cooler low pressure service water system supply control valve and reactor building auxiliary cooler low pressure service water system supply block valve had failed their respective leak rate tests due to material build up on the valve seats due to solids and debris. These valves did not have preventive maintenance activities to periodically disassemble and inspect/clean the valve internals. The corrective action was to create preventive maintenance activities in the work management system to periodically disassemble and inspect these valves to prevent future leak rate test failures. Preventive maintenance activities were also generated for the respective valves on Unit 1 and Unit 2. All valves were scheduled to be disassembled during their next respective refueling outage.

   The evaluation identified that valve seat leakage was the cause for the leak rate test failure on Oconee Unit 3. Accumulation of debris on the valve seat was determined to be the cause of the valve seating issue and that led to the excessive leakage. A review of the outage activities prior to the leak rate test for this penetration identified several outage related draining activities for multiple systems through this valve prior to testing. Service water system dead legs known to contain silt, sediment, and corrosion products were drained through the valve, leading to the accumulation of debris on the valve seat surfaces causing leakage. The corrective action was to revise the outage schedule for performing leak rate testing on this Unit 3 valve until after all draining and cleaning activities are complete. This change was also applied to the respective leak rate testing schedules for Oconee Unit 1 and Unit 2.

OE example 3 demonstrates that the actions under the current *10 CFR Part 50, Appendix J* program, including use of the corrective action program ensure appropriate corrective actions are taken to evaluate and correct deficiencies.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the*10 CFR Part 50, Appendix J* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO. Adverse conditions identified by the Appendix J program are identified and entered in the corrective action program for resolution.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *10 CFR Part 50, Appendix J* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *10 CFR Part 50, Appendix J* AMP provides reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.32 MASONRY WALLS

Program Description

The *Masonry Walls* AMP is an existing program implemented as part of the current *Structures Monitoring* (B2.1.33) AMP. It is based on the guidance provided in IE Bulletin 80-11, *"Masonry Wall Design"*, and NRC Information Notice 87-67, *"Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11"*, and is implemented through station procedures.

The *Masonry Walls* AMP manages inspections of masonry walls for cracks in joints, unsealed penetrations, missing or broken blocks, or separation from supports that could impact the intended function or potentially invalidate its evaluation basis. The program relies on periodic visual inspections, conducted at a nominal five year frequency to monitor and maintain the condition of masonry walls within the scope of SLR so that the established evaluation basis for each masonry wall remains valid during the SPEO. Observed aging effects that could impact masonry wall intended function or potentially invalidate its evaluation basis are entered into the corrective action process for further analysis, repair, or replacement. Masonry walls that are considered fire barriers are also managed by the *Fire Protection* (B2.1.15) program.

Aging effects of masonry wall structural steel support elements that provide technical basis for boundary conditions used in seismic analysis are managed by the *Structures Monitoring* (B2.1.33) AMP.

NUREG-2191 Consistency

The Oconee *Masonry Walls* AMP is an existing program that will be consistent with the ten elements of AMP Section XI.S5, *Masonry Walls* specified in NUREG-2191 (GALL-SLR) with enhancements described below.

Exception to NUREG-2191

None

Enhancements

The following enhancement will be implemented in the following program element: Parameters Monitored or Inspected (Element 3)

1. The masonry wall portion of the *Structures Monitoring* (B2.1.33) AMP will be updated to modify the parameters monitored to identify potential shrinkage and/or separation of masonry walls and include loss of material in addition to the currently managed cracking at joints (Element 3).

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Masonry Walls* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. Inspections of masonry walls are conducted as part of inspections performed under the *Structures Monitoring* (B2.1.33) AMP on a nominal five year interval. Reports from previous outage accessible inspections are reviewed prior to each new civil structure inspection. Items noted in previous inspection reports are revisited. Inspections are performed from the various elevations for the outage accessible locations. Items noted as continue to monitor and items with open work orders are carried forward into updated inspection reports.

   The evaluation criteria is ACI 349.3R, *"Evaluation of Existing Nuclear Safety-Related Structures*", which permits cracks up to 0.015" (0.4mm) (ACI 349.3R 5.1.1) without further evaluation, and cracks up to 0.04" if comparisons can be made to previous observed conditions (ACI 349.3R 5.2.1). Cracks greater than 0.04" noted for the first time during this exam are recorded and dispositioned to monitor during the next five year inspection.

   During recent civil structures inspections of the Oconee auxiliary building, turbine building, and radwaste facility, several small cracks (less than 0.04") were identified. These cracks have been measured, photographed, and documented in the Oconee corrective action program and are being monitored during future civil structures inspections. In addition, a hole was identified in a masonry wall, and a crack around a door frame was identified. Work orders were generated to repair these documented deficiencies.

   Oconee civil structure inspection results demonstrate that inspections of masonry walls are being performed in accordance with industry guidelines and that those inspections are effective in identifying aging effects prior to loss of intended function. OE example 1 demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and to monitor and trend the conditions.

2. During the installation of a new duct through a masonry wall in 2014, a crack in the wall was identified. The wall in question is located between Room 343 and the west hallway on the third floor of the auxiliary building near column line 86. Based on a walkdown of the wall by engineering, the crack was observed in the west face of the top course of masonry just on the south edge of the opening where a new duct frame was to be installed through the wall. From an engineering perspective, the cracked face of the block was evaluated and determined to be is acceptable "as is". It was further determined that while not desirable, a small portion of the west face of the block could be removed in the process of drilling the holes and installing the new duct frame would be acceptable. Planning for the installation of the new duct was adjusted to avoid disturbing the area of the cracked block face.

OE example 2 provides objective evidence that the corrective action program was used effectively to identify unanticipated conditions while performing activities in the field and implement corrective actions to evaluate and mitigate age-related aspects of the condition.

3. During an inspection of newly exposed wall surfaces in 2010, an issue with a masonry wall was observed. The top mortar joint for the masonry block walls on the West Side of the Cask Decontamination Room at elevation 796‘ - 809‘ were not fully covered by the underside of the beam at elevation 809‘. Based on the location of the wall near safety significant mechanical equipment and the determination that the wall could potentially fail during a seismic event, compensatory actions were required until seismic restraints were installed to address the condition.

   OE example 3 provides objective evidence that inspections are performed on newly accessible masonry wall surfaces, and that use of the corrective action program is an effective process for correcting identified deficiencies.

4. A seismic and flood walkdown performed in 2012 in response to Fukushima Near-Term Task Force Recommendation 2.3 (SECY-11-0093) identified one discrepancy and one potential issue involving masonry walls:

   a. A seismic evaluation performed in 1996 identified that a seismic strut should be cut at a masonry wall/concrete wall interface but was found to be still connected during the walkdown. Subsequent analysis was performed to document the acceptability of the as found condition and concluded that strut did not need to be cut.
   b. An opening in a masonry wall penetration was observed with unsupported large bore piping penetrating the wall. A concern was identified that the unsupported length of large bore piping could adversely impact the equipment in the area during a seismic event. An assessment was performed to confirm that neither the wall or the piping were required to be seismically qualified. Potential flooding of the auxiliary building from a postulated non-seismic pipe breach was addressed and documented acceptable.

   OE example 4 demonstrates the effective use of industry OE and the corrective action program to identify potential non-conforming conditions, and take timely corrective action to ensure components in the scope of LR are evaluated and maintained consistent with the CLB for the SPEO.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the masonry walls AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the masonry walls AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Masonry Walls* AMP, as a subset of the *Structures Monitoring* (B2.1.33) AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with ONS CLB during the SPEO.

B2.1.33 STRUCTURES MONITORING

Program Description

The *Structures Monitoring* AMP is an existing condition monitoring program that consists of periodic visual inspection and monitoring the condition of concrete and steel structures, structural components, component supports, and structural commodities to ensure that aging degradation (such as those described in ACI 349.3R, ACI 201.1R, SEI/ASCE 11, and other documents) will be detected, the extent of degradation determined and evaluated, and corrective actions taken prior to loss of intended functions. Quantitative results (measurements) and qualitative information from periodic inspections are trended with sufficient detail, such as photographs and surveys for the type, severity, extent, and progression of degradation, to ensure that corrective actions can be taken prior to a loss of intended function. The acceptance criteria are derived from applicable consensus codes and standards. For concrete structures, the program includes personnel qualifications and quantitative evaluation criteria of ACI 349.3R. Structures are monitored on an interval of a nominal five years. The interval may be increased to a nominal 10-year frequency with appropriate justification based on the structure, environment and related inspections. There are provisions for more frequent inspections when conditions are observed that have a potential for impacting an intended function. Unacceptable conditions, when found, are evaluated or corrected in accordance with the corrective action program. The monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant age related degradation to ensure there is no loss of intended function.

The *Structures Monitoring* AMP was developed to implement the requirements of 10 CFR 50.65 and is based on NUMARC 93-01, *"Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,"* and Regulatory Guide 1.160, *"Monitoring the Effectiveness of Maintenance at Nuclear Power Plants."* The program includes elements of the *Masonry Walls* (B2.1.32) program and *Inspection of Water-Control Structures Associated with Nuclear Power Plants* (B2.1.34) program.

Concrete structures are inspected for indications of deterioration and distress including evidence of leaching, loss of material, cracking, and a loss of bond, as defined in ACI 201.1R. Steel components are inspected for loss of material due to corrosion. Inspections also include seismic joint fillers, elastomeric materials; and fiber reinforced polymers and steel bracings associated with masonry walls. The program also includes provisions for periodic testing and assessment of groundwater chemistry and opportunistic inspections of accessible below grade concrete structures.

Protective coatings are not relied upon to manage the effects of aging for structures included in the scope of this program. A dewatering system is not relied upon to control settlement and porous concrete was not used in the design of foundations.

Applicable components within the scope of this program include, but are not limited to: bolting, concrete anchors and embedments, concrete components, decking and siding, doors and door seals, ductbanks, external surfaces of bus enclosures (metallic ducting) and bus enclosure structural supports, expansion and seismic joints, foundations, hatches, hazard barriers, metal components such as louvers, miscellaneous steel, penetrations seals and sleeves, piles, pipe whip restraints and jet impingement shields, shielding, steel components, steel liners, supports, panels, racks, cabinets, enclosures, cable trays, conduits, wire way gutters, and tubing track.

Applicable metallic materials within the scope of this program include: aluminum, carbon steel, ductile iron, galvanized steel, and stainless steel; applicable bolting materials include: carbon steel, galvanized steel, and stainless steel. Applicable non-metallic materials within the scope of this program include: reinforced concrete, elastomer, fiberglass reinforced polymer, grout, and Lubrite.

Applicable environments within the scope of this program include air-outdoor, air-indoor uncontrolled, air, air with borated water leakage, treated water, raw water, water-flowing, and groundwater/soil and soil.

Applicable aging effects within the scope of this program include change in material properties/ loss of strength, cracking, loss of material, loss of mechanical function, loss of preload/ self-loosening, and loss of sealing.

NUREG-2191 Consistency

The *Structures Monitoring* AMP is an enhanced program that will be consistent with the recommendations provided in Section XI.S6, *Structures Monitoring* program of NUREG-2191 with the enhancements described in below.

Exception to NUREG-2191

None

Enhancements

The following enhancements will be implemented in the following program elements: Scope of Program (Element 1), Preventive Actions (Element 2), Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4), Monitor and Trending (Element 5), and Acceptance Criteria (Element 6).

1. Add the following structures to the scope of the program (Element 1):

    a) Microwave house structure
    b) Technical support building cable vault
    c) 100kv structure
    d) Protected service water building
    e) Protected service water duct banks
    f) Borated water storage tank superstructure
    g) HP Office Building
    h) Administration Building

2. Procedures will be revised to specify that structural components inspected include structural bolting, anchor bolts and embedments, supports and bracings associated with

masonry walls, pipe whip restraints and jet impingement shields, transmission towers, panels and other enclosures, racks, sliding surfaces, sump and pool liners, electrical cable trays and conduits, tube tracks, electrical duct banks, manholes, doors, penetration seals, and other elastomeric materials (Element 1).

3. Expand the monitoring and evaluation of raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of SLR (Element 1):

    a) Enter adverse results, which exceed water chemistry criteria, into the corrective action program. As part of the corrective actions, if aggressive groundwater is identified that might affect structures in scope for SLR, perform additional water testing at additional locations and perform soil testing in order to confirm the extent, severity, and potential aging mechanisms resulting from the aggressive groundwater/ soil.
    b) Develop engineering evaluations to evaluate the water chemistry results to assess the impact, if any, on below-grade concrete, including the potential for further degradation due to the aggressive groundwater, as well as consideration of current conditions. As part of the engineering evaluations, determine if additional actions are warranted, which might include enhanced inspection techniques and/or increased frequency, destructive testing, and focused inspections of representative accessible (leading indicator) or below grade, inaccessible concrete structural elements exposed to aggressive groundwater/soil.
    c) Develop the initial engineering evaluations prior to the SPEO. Develop follow-up engineering evaluations on an interval not to exceed five years.
    d) If aggressive groundwater and soil is identified, at a minimum, perform focused inspections of representative, accessible (leading indicator) structural elements, or if accessible areas will not be leading indicators for the potential aging mechanisms, excavate and inspect buried concrete elements exposed to aggressive groundwater/ soil.
    e) If degraded concrete is identified, as part of the focused inspections of leading indicators (representative, accessible or exposed inaccessible concrete), enter adverse results that exceed ACI 349.3R second tier criteria into the corrective action program, and expose inaccessible concrete so that the extent of the condition can be determined, baseline conditions documented, and additional actions identified such as repairs, new preventative actions, additional evaluations, and future inspections.

4. For structural bolting consisting of ASTM A325, ASTMF1852, and/or ASTM A490, provide guidance for storage, lubricants, and the steps to minimize stress corrosion cracking potential discussed in Section 2 of Research Council for Structural Connections publication, “Specification for Structural Joints Using ASTM A325 or A490 Bolts”. (Element 2)

5. Provide guidance so that when replacement bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants will be in accordance

with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339. (Element 2)

6. Provide guidance for proper specification of new high strength bolting material and lubricant to prevent or mitigate degradation and failure of structural bolting in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339. (Element 2)

7. Expand the program to include details regarding inspection and evaluation for steel liners. (Element 3)

8. Provide inspection and evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. The program will be enhanced to explicitly mention the changes in material properties of increase in porosity and permeability, and loss of strength and pattern cracking with darkened edges. (Element 3)

9. Develop a new implementing procedure or revise an existing implementing procedure to address aging management of inaccessible areas exposed to potentially aggressive groundwater/soil environment that will include the following (Element 2, 3, and 4):

   a) Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of SLR.
   b) Enter adverse results, which exceed water chemistry criteria, into the corrective action program. As part of the corrective actions, if aggressive groundwater is identified that might affect structures in scope for SLR, perform additional water testing at additional locations and perform soil testing in order to confirm the extent, severity, and potential aging mechanisms resulting from the aggressive groundwater/soil.
   c) Develop engineering evaluations to evaluate the water chemistry results to assess the impact, if any, on below-grade concrete, including the potential for further degradation due to the aggressive groundwater, as well as consideration of current conditions. As part of the engineering evaluations, determine if additional actions are warranted, which might include enhanced inspection techniques and/or increased frequency, destructive testing, and focused inspections of representative accessible (leading indicator) or below grade, inaccessible concrete structural elements exposed to aggressive groundwater/soil.
   d) Develop the initial engineering evaluations prior to the SPEO. Develop follow-up engineering evaluations on an interval not to exceed five years.
   e) If aggressive groundwater and soil is identified, at a minimum, perform focused inspections of representative, accessible (leading indicator) structural elements, or if accessible areas will not be leading indicators for the potential aging mechanisms, excavate and inspect buried concrete elements exposed to aggressive groundwater/soil.
   f) If degraded concrete is identified, as part of the focused inspections of leading indicators (representative, accessible or exposed inaccessible concrete), enter adverse results that exceed ACI 349.3R second tier criteria into the corrective action

program, and expose inaccessible concrete so that the extent of the condition can be determined, baseline conditions documented, and additional actions identified such as repairs, new preventative actions, additional evaluations, and future inspections.

10. Monitor and trend through-wall groundwater leakage, infiltration volumes, and leakage water chemistry for signs of concrete or steel reinforcement degradation. Develop additional engineering evaluations, which consider more frequent inspections, as well as destructive testing of affected concrete to validate existing concrete properties, and leakage water chemistry results. If leakage volumes allow, consider water chemistry analysis of the leakage pH, along with mineral, chloride, sulfate and iron content in the water. (Element 2, 3, and 4)

11. Expand the program to monitor accessible sliding surfaces for indications of significant loss of material due to wear or corrosion, and for accumulation of debris or dirt. Establish acceptance criteria for sliding surfaces as no significant loss of material due to wear or corrosion, and no debris or dirt that could restrict or prevent sliding of the surfaces, as required by design. (Element 3 and 6)

12. Expand the program to monitor elastomeric vibration isolators and bearing pads, structural sealants, and seismic joint fillers for cracking, loss of material, and hardening. Supplement visual inspection of elastomeric elements with tactile inspection to detect hardening, if the intended function is suspect. Establish acceptance criteria, for elastomeric pads and vibration isolation elements, structural sealants, and seismic joint fillers, as no loss of material, cracking, or hardening that can lead to loss of isolation or support function. (Element 3, 4, and 6)

13. Require that personnel performing inspections and evaluations meet the qualifications specified within ACI 349.3R with respect to knowledge of inservice inspection of concrete and visual acuity requirements. (Element 4)

14. Perform inspections under the enhanced program in order to establish quantitative baseline inspection data to a sufficient detail to allow for trending, prior to the SPEO. (Element 4 and 5)

15. Revise inspection procedures to base inspection acceptance criteria on quantitative requirements derived from industry codes and standards, including but not limited to ACI 349.3R, ACI 318, SEI/ASCE 11, or the relevant AISC specifications and consider industry and plant OE. Use justified quantitative acceptance criteria whenever applicable. (Element 6)

16. Provide evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. Base the acceptance criteria for concrete surfaces on the second tier evaluation criteria provided in Chapter 5 of ACI 349.3R. (Element 6)

17. Clarify that loose bolts and nuts are not acceptable unless accepted by engineering evaluation. (Element 6)

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Structures Monitoring* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In 2011, engineering reviewed NRC Information Notice 11-20, *Concrete Degradation by Alkali-Silica Reaction*, to determine if additional actions were required. The review identified the scope of inspections to be performed on concrete structures looking for evidence of patterned cracking indicative of alkali-silica reaction. There has been no visual evidence of patterned cracking indicative of alkali-silica reaction on the exterior of any concrete structures on sites that are exposed to water, except the Keowee spillway wing walls, which have shown evidence of small amounts of expansion in the past. Since 2005, frequent monitoring of the Keowee spillway wing walls has taken place to document and trend the inward expansion of these walls. It was ultimately concluded by testing of the Keowee spillway wing walls that alkali-silica reaction was the contributing cause of this expansion; however, wall movements were very small and posed no significant risk to the structural integrity of the walls. There was no visual evidence of alkali-silica reaction at the Keowee spillway wing walls. As a result of the experience at Keowee, site personnel at Oconee who perform structures monitoring inspections of concrete are familiar with alkali-silica reaction.

   OE example 1 provides objective evidence that industry OE is reviewed for applicable aging effects, and appropriate actions are included in AMPs. This example also illustrates how program inspections, effectively monitor in scope SSCs to assure that these components will continue to perform their intended functions, and that appropriate aging management will be performed during the SPEO.

2. In February 2018, it was identified that the Unit 2 and Unit 3 tendon gallery inspections were not completed in 2017. Even though portions of the tendon galleries are inspected as part of the *ASME Section XI, Subsection IWL* (B2.1.29) AMP, the entire tendon gallery was not inspected. The tendon gallery inspections were subsequently completed, the results recorded, and conditions determined to be acceptable. The model work order describing inspection activities to be performed was updated to add tasks to ensure that the tendon gallery inspections would be acceptably completed going forward.

   OE example 2 provides objective evidence that identified programmatic deficiencies involving inspection planning and implementation are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct deficiencies.

3. In March 2018, it was identified that structures inspections of the independent spent fuel storage facility were not completed on the specified frequency in 2017. In 2017, the external surfaces of the independent spent fuel storage facility were visually inspected. After further review of the independent spent fuel storage facility commitment information,

it was determined that the inspection that was completed in 2017 was not sufficient. An internal inspection of at least one horizontal storage module was due in 2016 but had not been completed. The internal inspection was subsequently completed, and the conditions were acceptable. Changes were developed to the implementing work order instructions to prevent recurrence. To address concerns involving the potential extent of missed commitments associated with structural inspections, other reviews were performed to ensure commitment compliance, including the inspections at the intake structure and of fiber-reinforced polymer exterior reinforcement of masonry walls, which is described in OE example 7 below.

Although independent spent fuel storage facility structures inspections are outside the scope of the Structures Monitoring AMP, OE example 3 provides objective evidence that identified programmatic deficiencies involving inspection planning and implementation are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct deficiencies.

4. Condition monitoring inspections of structures included in the scope of the LR Rule are required to be performed on a nominal five year interval. Results of ongoing civil structures inspections are documented and represent Oconee plant specific operating experience.

   The inspection results for the different inspections in the same structures and areas are collated into a calculation so that current inspection results can be compared to previous inspection results. The structures monitoring inspection results in these calculations were reviewed. Degradation of structures and structural elements was identified in different areas included under the structures monitoring inspections. The degradation is recorded, compared to previous results, reviewed and evaluated by qualified personnel, and significant degradation is entered into the corrective action program to initiate corrective actions such as repairs or replacements, more frequent inspections, more detailed evaluations, or design changes. The review of the inspection results and issues in the corrective action program determined that: 1) degradation was identified and documented; 2) structural repairs are performed under the corrective action program; 3) accessible areas are inspected nominally every five years; and 4) inaccessible areas are evaluated. Ongoing inspections and evaluations have not revealed results that would challenge an intended function. The performance of inspections and evaluation of issues in the corrective action program have resulted in the effective implementation of the AMP.

   Oconee civil structure inspection results demonstrate that inspections are being performed in accordance with industry guidelines and that those inspections are effective in identifying aging effects prior to loss of intended function. Pertinent examples of ONS civil structure inspection results are included in OE examples 5 through 7 below. These OE examples demonstrate that continued implementation of the *Structures Monitoring* AMP will assure that the structures and components within the scope of the program will continue to perform their intended functions during the SPEO.

5. The structures monitoring implementing procedures and currently documented inspection results were reviewed to assess compliance with the level of detail recommended in the SLR-GALL. Enhancements to the implementing procedures have been developed to

meet the level of detail in the SLR-GALL. It was found that the documented inspection results, especially in later years, frequently meet the SLR-GALL recommendations. The following are examples:

In 2017, an inspection of the standby shutdown facility diesel exhaust chimney and roof was performed. Concrete crack widths, lengths and orientation were recorded and compared to previous inspections. No significant changes to the concrete degradation were identified. All previously identified cracks are assessed as unchanged, inactive and stable and likely formed shortly after construction. Many additional cracks were observed in floors and walls but not recorded in this report because they do not pose a structural concern. Cracks observed during this exam greater than 0.015” were recorded for future monitoring. The cracks in the curb above the diesel exhaust chimney were significantly larger as compared to the size reported in the 2012 report. A large portion of the curb was repaired following the 2017 inspection in 2018. Because of the curb cracking, condition reports were initiated in the corrective action program and a more detailed inspection of the inside of the diesel exhaust chimney was performed using a borescope, camera, and flashlight. It was determined that the chimney is structurally sound and is capable of performing it’s intended function. The concrete damage was attributed to diesel exhaust coming off the deflector plate and hitting the concrete directly north of the deflector plate. The degraded concrete was identified for monitoring during subsequent inspections.

In 2020, the reactor building for Unit 3 was found to be structurally in very good condition. A condition report was written to document all findings. Items listed in the previous condition monitoring inspection report from spring of 2016 were reviewed and located during the 2020 inspection. Cracks that were previously noted as 0.010” wide or smaller were not monitored. Cracks 0.015” wide or larger are monitored with reference made to ACI 349.3R. Some findings are the following: 1) missing anchor bolts at a hanger support plate were evaluated and it was determined that the support plate had previously been found to be adequate; 2) cracks in a grout pad under a base plate were photographed and a work request was initiated for a repair; and 3) a concrete crack in a wall was measured with a crack comparator for width, the crack length documented, and the crack photographed to allow for trending.

OE example 5 provides objective evidence that the existing *Structures Monitoring* AMP effectively monitors and manages the condition of structures, more detailed inspections are performed when needed, and inspection records will allow for the recommended trending of inspection results in conjunction with implementation of enhancements. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and to monitor and trend the conditions.

6. Plant OE was reviewed to identify instances of water infiltration into plant structures, and to assess any impact on the functions of in scope structures. Water infiltration into the plant is addressed through inspections and corrective actions, and monitoring is in place to ensure that the effects are insignificant. Several examples are provided below.

   Roofing is included within the scope of the inspections. Inspection results are recorded, and repairs initiated. As an example, the roof replacements on the turbine buildings were completed in 2019. Completion of this project ensured that the turbine buildings and equipment are protected.

In 2010 in the east penetration room of the Unit 2 auxiliary building and in 2013, in the Unit 3 spent fuel cooler room in the auxiliary building, plant walkdowns and inspections identified deficient penetration seals caused by mechanical damage, not aging. The potential consequences of the seal failures under design conditions were evaluated and it was determined that there would not have been a loss of intended function for potentially impacted equipment due to the small size of the defects with respect to the margin. The deficient seals were repaired. The inspections were expanded to include other seals. Preventative maintenance inspections were initiated.

In 2012, the standby shutdown facility inspection results for annual groundwater in-seepage inspection revealed concrete cracks in exterior walls. an engineering evaluation found that the cracks were deemed acceptable. Cracks in exterior, basement walls with groundwater seepage had previously been identified in 1997 and repairs initiated. In 2002, the inspection report documents that the groundwater seepage through hairline cracks in basement concrete walls had been satisfactorily corrected.

The Unit 2 auxiliary building, low pressure injection pump room had a larger amount of water than other locations. Numerous plans have been completed to try to stop the water in leakage. Sealant has been placed along the joint for the floor and the wall, an attempt was made to stop the water by seal injecting the cracks in the wall, and a water diversion was installed in the tendon gallery to allow the water to drain down into the tendon gallery instead of going into the low pressure injection pump room through an engineering change in 2011. The amount of water coming in now has significantly decreased since the engineering change was completed. Currently the water intrusion is now a housekeeping issue rather than a structural concern.

The structures monitoring inspection results in the various calculations were reviewed. Significant structural effects due to water leakage or water infiltration were not identified. Generally, the leakage was a housekeeping concern that could be addressed by generating corrective maintenance activities to minimize the housekeeping impacts when the leakage was significant. The *Structures Monitoring* program inspections identified and evaluated minor losses of material on steel components exposed to water leakage. No indications of significant concrete degradation due to groundwater infiltration have been identified.

In accordance with plant procedures the spent fuel pool leak detection valves are opened and inspected for visible leakage during weekly operator rounds. Significant spent fuel pool leakage was not identified through corrective action program condition report searches.

OE example 6 provides objective evidence that water infiltration into plant structures is addressed through inspections, the scope of inspections are expanded to identify the extent of the condition, potential consequences of degradation are evaluated, conditions are monitored and evaluated, and corrective actions are taken, including preventative maintenance as well as repairs and replacement, to identify the leakage source, reduce the potential for degradation due to exposure to water infiltration, and to ensure functional requirements are met.

7. The inspection of fiber-reinforced polymer external reinforcement of exterior masonry walls is within the scope of the *Structures Monitoring* AMP.

The fiber reinforced polymer is installed on the exterior masonry walls of each unit's auxiliary building. The fiber reinforced polymer is required to ensure the structural integrity of these masonry walls when subjected to design-basis tornado differential pressure loading. The fiber reinforced polymers are covered by siding installed as part of the natural phenomena barrier applied to safety related SSC structures so as to provide tornado/wind protection to the underlying structure. The installation of the fiber reinforced polymer was approved through a license change approved by the NRC in 2011. The inspections include a visual inspection of the mortar joints at the bottom of the walls and portions of the in-service walls for degradation. The adhesion (pull-off) testing of the fiber reinforced polymer is documented in accordance with implementing work instructions.

The inspections were completed every outage for the first six years after installation (2012-2017). Then, based on no observed fiber reinforced polymer degradation, the inspection frequency transitioned to every other outage for the next four years (2018-2021). Then, if justified, based on continued no observed fiber reinforced polymer degradation, the inspection frequency will transition to every third outage thereafter (2022-2034). At this time the inspections are being completed every other outage. This inspection frequency was approved by the NRC as part of the SER for the license change.

Visual inspections of test walls and portions (both random and controlled locations) include changes in color, debonding, peeling, blistering, cracking, crazing, deflections and other anomalies. No fiber reinforced polymer degradation has been observed. Inspection results are documented with photos at each inspection, used for comparison of new results with previous inspection results and post installation photos. Quantitative acceptance criteria using industry guidance is provided. Provisions included describing further inspections and tests to be considered if degradation is identified.

In 2018, because of recent OE concerning other inspection commitments (as previously mentioned), engineering decided to complete a thorough review of fiber reinforced polymer inspection commitments. While reviewing Unit 3 fiber reinforced polymer inspection results from the 29th refueling outage, engineering discovered a portion of the fiber reinforced polymer inspection was not completed as required. It was found that the required visual inspections of mortar joints located along the bottom edge of fiber reinforced polymer-strengthened masonry walls were not performed. The commitment to perform visual inspection of the mortar joints along the bottom edge of fiber reinforced polymer-strengthened masonry walls would identify any sliding of the walls when exposed to tornado-induced differential pressure (walls would slide outward). During original installation of the fiber reinforced polymer, model work instructions were generated to perform visual inspections of the walls where fiber reinforced polymer is applied and for the adhesion testing of the fiber reinforced polymer on test walls. A model work instruction was not generated for visual inspections of the mortar joints along the bottom edge of fiber reinforced polymer-strengthened walls. Because of the siding and girt system installed over the fiber reinforced polymer walls, many of the mortar joints are inaccessible from the exterior side of the walls. Interior inspections of the walls were completed per the structures monitoring inspection procedure in 2012 and 2017. Additionally, a walk down was performed by engineering in April 2018 to re-inspect the interior side of fiber reinforced polymer-strengthened walls, specifically focusing on the mortar joints around the perimeter of the walls. No significant degradation was observed. Any sliding of the wall due to pressure would be visible. Previous visual inspections, including the one performed in 2018, did not find any evidence to suggest any sliding has occurred. A model work instruction was created to ensure the interior side of the fiber reinforced polymer-strengthened walls are inspected, specifically the mortar joint along the bottom of the walls.

In 2018, as a result of the incomplete fiber reinforced polymer inspections, an extent of condition review of other structures/features was performed to ensure that the licensing committed inspection scope had been properly translated into model work instruction scope. Included in the scope of review were the following structures/features: 1) protected service water building and ductbank; 2) trench 3; 3) standby shutdown facility fuel oil storage tank; 4) external flood walls and east slope protection; 5) Keowee underground trench; 6) borated water storage tank superstructure; and 7) FLEX building. The extent of condition review was completed, and it was determined that the other commitments were adequately addressed in associated model work instructions.

OE example 7 provides objective evidence that inspection results are recorded using photographs so that quantitative comparisons can be made to previous test results that allows for trending, and quantitative acceptance criteria are used that are based upon industry standards for the component type, material, and environment combination. This OE also provides objective evidence that self-assessments are performed to verify compliance with commitments, plant OE is considered, the scope is expanded to identify the extent of deficient conditions, and corrective actions are taken if deficiencies are identified.

8. In September 2019, a self assessment of the Oconee civil structures inspection program was performed to verify that the existing aging management activities to identify and correct age-related degradation of structures and structural elements within the scope of the program, is being effectively implemented. The program self assessment was comprised of a review of previous self assessments, structures monitoring implementing procedures, inspections results, and programmatic issues addressed in the corrective action program for age-related degradation of structures and structural elements. The self assessment found that aging management activities were being performed in accordance with commitments, but identified several opportunities for improvement applicable to the civil structures inspection program documentation. As a result of the self assessment, license renewal documentation was evaluated for consistency and accuracy. In addition, implementing procedures and work orders were reviewed to verify license renewal programmatic standards are met.

OE example 8 provides objective evidence that aging management activities have been implemented in accordance with initial license renewal commitments and that self-assessments are used to identify and implement programmatic improvements.

Overall, the above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Structures Monitoring* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO. Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided when significant aging effects are found. Assessments of the *Structures Monitoring* AMP have been performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

<u>Conclusion</u>

The implementation of the *Structures Monitoring* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.34 INSPECTION OF WATER-CONTROL STRUCTURES ASSOCIATED WITH NUCLEAR POWER PLANTS

Program Description

The *Inspection of Water-Control Structures Associated with Nuclear Power Plants* AMP is an existing inservice inspection and surveillance program for dams, slopes, canals, and other raw water-control structures associate with emergency cooling water systems or flood protection at Oconee. The program addresses age-related deterioration, degradation due to environmental conditions, and the effects of natural phenomena that may affect water-control structures. The program provides for periodic monitoring and maintenance of water-control structures so that the consequences of age-related deterioration and degradation can be prevented or mitigated in a timely manner, in order to prevent a loss of intended function.

Structural components and commodities monitored under this program include steel bolting, concrete anchors; concrete elements; concrete and steel elements of the condenser circulating water discharge pipe, penstock, power tunnels, spillway, and intakes; steel members; as well as steel piles, sluice gates, and trash racks; and equipment supports and foundations. Because of the plant design, there are no stand alone, external flood protection features that are in scope for SLR. The flood protection features are part of a structure, such as an exterior wall or earthen dam, which are in scope for SLR.

The program manages loss of material, loss of preload, cracking, loss of bond, loss of form, increase in porosity and permeability, and reduction of strength. Environments include outdoor air, groundwater/soil, and water flowing or standing.

RG 1.127 describes a basis acceptable to the NRC staff for developing an appropriate inservice inspection and surveillance program for dams, slopes, canals, and other water-control structures associated with emergency cooling water systems or flood protection of nuclear power plants. Instead of committing to RG 1.127, at Oconee, these types of structures are managed in accordance with the requirements of the FERC five year inspection requirements. The inspections of dams and dikes, within the scope of this program, include inspections of the Keowee river dam; Keowee spillway and left abutment, Keowee intake and powerhouse; little river dam; little river dikes A, B, C, and D; and the Oconee intake canal dike. These inspections are performed in accordance with the requirements contained in *Title 18 of the Code of Federal Regulations, Conservation of Power and Water Resources, Part 12, Safety of Water Power Projects and Project Works, Subpart D* (Inspection by Independent Consultant). The SLR-GALL has determined that for dam inspection and maintenance, programs under the regulatory jurisdiction of the FERC or the U.S. Army Corps of Engineers, continued through the SPEO, are adequate for the purpose of aging management.

The *Inspection of Water-Control Structures Associated with Nuclear Power Plants* AMP addresses age-related deterioration, degradation due to extreme environmental conditions, and the effects of natural phenomena that may affect the intended functions of the water-control structures and components in the scope of this program. The monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent the loss of intended function due to significant age-related degradation. Elements of the program are designed to provide records of periodic inspections and evaluations of structural conditions to detect age-related deterioration and degradation and to initiate maintenance activities and corrective actions so that the consequences of age-related deterioration and degradation can be prevented or mitigated in a timely manner.

In general, parameters monitored are in accordance with FERC requirements for dams and dikes and those in Section C.2 of RG 1.127, *"Inspection of Water Control Structures Associated with Nuclear Power Plants",* for the remaining structures within the scope of this program. Oconee is not currently committed to the requirements in NRC RG 1.127, but RG 1.127 has been considered in the site procedure for inspections of structures in scope for SLR. The site aging management procedure refers to the guidance provided in NRC RG 1.127 and American Concrete Institute 349.3R-02. Structures exposed to aggressive water require additional plant-specific investigation.

Inspections of the Keowee river dam; little river dam; little river dikes a, b, c, and d; Oconee intake canal dike; Keowee spillway and left abutment, Keowee intake and powerhouse are performed in accordance with the requirements contained in 18 CFR Part 12, *Safety Of Water Power Projects And Project Works*. Specific corrective actions and confirmation are implemented in accordance with the corrective action program.

The inspections performed under the FERC five year inspection program have been approved by FERC and are the CLB for Oconee regarding aging management of the dams. Oconee will continue to comply with these FERC requirements during the SPEO.

The *Inspection of Water-Control Structures Associated with Nuclear Power Plants* AMP is implemented through the *Structures Monitoring* (B2.1.33) AMP for the associated in scope structures.

NUREG-2191 Consistency

The *Inspection of Water-Control Structures Associated with Nuclear Power Plants* AMP is an existing program that will be consistent with the recommendations provided in Section XI.S7, *Inspection of Water-Control Structures Associated with Nuclear Power Plants* program of NUREG-2191 (GALL-SLR) with enhancements described below.

Exception to NUREG-2191

None

Enhancements

The following enhancements will be implemented in the following program elements: Preventive Actions (Element 2), Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), and Acceptance Criteria (Element 6).

1. For structural bolting consisting of ASTM A325, ASTMF1852, and/or ASTM A490, provide guidance for storage, lubricants, and the steps to minimize stress corrosion cracking potential discussed in Section 2 of Research Council for Structural Connections

publication, *“Specification for Structural Joints Using ASTM A325 or A490 Bolts”*. (Element 2)

2. Provide guidance so that when replacement bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants will be in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339. (Element 2)

3. Provide guidance for proper specification of new high strength bolting material and lubricant to prevent or mitigate degradation and failure of structural bolting in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339. (Element 2)

4. Provide inspection and evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. The program will be enhanced to incorporate monitoring for movements (e.g., settlement, heaving, and deflection), conditions at junctions with abutments and embankments, pattern cracking with darkened edges, the changes in material properties of increase in porosity and permeability, and loss of strength. (Element 3)

5. Expand the program to monitor accessible sliding surfaces for indications of significant loss of material due to wear or corrosion, and for accumulation of debris or dirt. Establish acceptance criteria for sliding surfaces as no significant loss of material due to wear or corrosion, and no debris or dirt that could restrict or prevent sliding of the surfaces, as required by design. (Element 3)

6. Require that personnel performing inspections and evaluations meet the qualifications specified within ACI 349.3R with respect to knowledge of inservice inspection of concrete and visual acuity requirements. (Element 4)

7. Create provisions for special inspections immediately following the occurrence of significant natural phenomena, such as large floods, earthquakes, hurricanes, tornadoes, or intense local rainfalls. (Element 4)

8. Require the evaluation of raw water and groundwater chemistry that is sampled from a location that is representative of the water in contact with structures within the scope of SLR by the responsible engineer. This will be done on an interval not to exceed five years and account for seasonal variations (e.g., quarterly monitoring every fifth year). (Element 4)

9. Develop a new implementing procedure or revise an existing implementing procedure to enhance the aging management of inaccessible areas exposed to potentially aggressive groundwater/soil environment that will include the following (Element 4):

    a. Monitor raw water and ground water chemistry, for pH, chlorides, and sulfates, on a frequency not to exceed five years that accounts for seasonal variations (e.g., quarterly monitoring every fifth year), from locations that are representative of the groundwater in contact with structures within the scope of SLR.

b. Enter adverse results, which exceed water chemistry criteria, into the corrective action program. As part of the corrective actions, if aggressive groundwater is identified that might affect structures in scope for SLR, perform additional water testing at additional locations and perform soil testing in order to confirm the extent, severity, and potential aging mechanisms resulting from the aggressive groundwater/ soil.

c. Develop engineering evaluations to evaluate the water chemistry results to assess the impact, if any, on below-grade concrete, including the potential for further degradation due to the aggressive groundwater, as well as consideration of current conditions. As part of the engineering evaluations, determine if additional actions are warranted, which might include enhanced inspection techniques and/or increased frequency, destructive testing, and focused inspections of representative accessible (leading indicator) or below grade, inaccessible concrete structural elements exposed to aggressive groundwater/soil.

d. Develop the initial engineering evaluations prior to the SPEO. Develop follow-up engineering evaluations on an interval not to exceed five years.

e. If aggressive groundwater and soil is identified, at a minimum, perform focused inspections of representative, accessible (leading indicator) structural elements, or if accessible areas will not be leading indicators for the potential aging mechanisms, excavate and inspect buried concrete elements exposed to aggressive groundwater/ soil.

f. If degraded concrete is identified, as part of the focused inspections of leading indicators (representative, accessible or exposed inaccessible concrete), enter adverse results that exceed ACI 349.3R second tier criteria into the corrective action program, and expose inaccessible concrete so that the extent of the condition can be determined, baseline conditions documented, and additional actions identified such as repairs, new preventative actions, additional evaluations, and future inspections.

10. Monitor and trend through-wall groundwater leakage, infiltration volumes, and leakage water chemistry for signs of concrete or steel reinforcement degradation. Develop additional engineering evaluations, which consider more frequent inspections, as well as destructive testing of affected concrete to validate existing concrete properties, and leakage water chemistry results. If leakage volumes allow, consider water chemistry analysis of the leakage pH, along with mineral, chloride, sulfate and iron content in the water. (Element 4)

11. Perform inspections under the enhanced program in order to establish quantitative baseline inspection data to a sufficient detail to allow for trending, prior to the SPEO. (Element 5)

12. Provide evaluation criteria for structural concrete using quantitative second tier criteria of Chapter 5 in ACI 349.3R. Base the acceptance criteria for concrete surfaces on the “second-tier” evaluation criteria provided in Chapter 5 of ACI 349.3R. (Element 6)

13. Clarify that loose bolts and nuts are not acceptable unless accepted by engineering evaluation. (Element 6)

14. Degradation of piles and sheeting are accepted by engineering evaluation or subject to corrective actions. (Element 6)

15. Revise inspection procedures to base inspection acceptance criteria on quantitative requirements derived from industry codes and standards, including but not limited to ACI 349.3R, ACI 318, SEI/ASCE 11, or the relevant AISC specifications and consider industry and plant OE. Use justified quantitative acceptance criteria whenever applicable. (Element 6)

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Inspection of Water-Control Structures Associated with Nuclear Power Plants* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In September 2019, a self-assessment of the Oconee civil structures inspection program, including water controlled structures, was performed to verify that the existing aging management activities to identify and correct age-related degradation of structures and structural elements within the scope of the program, are being effectively implemented in the first period of extended operation. The program self assessment was comprised of a review of previous self assessments, structures monitoring implementing procedures, inspections results, and programmatic issues addressed in the corrective action program for age-related degradation of structures and structural elements. The self assessment identified several opportunities for improvement applicable to the water-control structures inspection program. As a result of the self assessment, license renewal documentation was evaluated for consistency and accuracy. In addition, implementing procedures and work orders were reviewed to verify license renewal programmatic standards are met.

   This operating experience example provides objective evidence that aging management activities have been implemented in accordance with initial LR commitments and that self-assessments are used to identify and implement programmatic improvements.

2. In March 2018, it was identified that structural inspections of the independent spent fuel storage facility were not completed on the specified frequency in 2017. In 2017, the external surfaces of the independent spent fuel storage facility were visually inspected. After further review of the independent spent fuel storage facility commitment information, it was determined that the inspection that was completed in 2017 was not sufficient. An internal inspection of at least one horizontal storage module was due in 2016 but had not been completed. The internal inspection was subsequently completed, and the conditions were acceptable. Changes were developed to the implementing work order instructions to prevent recurrence. To address concerns involving the potential extent of missed commitments associated with structural inspections, other reviews were performed to ensure commitment compliance, including the inspections at the intake structure and of the fiber-reinforced polymer exterior reinforcement of masonry walls.

The extent of condition review for the intake structure determined that the 2017 inspection of the Unit 1 intake structure was not complete as well. Divers completed the inspection of the skimmer wall, underwater weir, and other easily accessible areas. Other parts of the Unit 1 intake structure are more difficult to access because they cannot be accessed by boat. The remaining inspection activities were to be bundled with additional inspections on the Unit 2 intake structure, but the work order was closed without additional action. This was entered into the corrective action program. Engineering performed a review of the previous inspection results as well as the results of what was identified during the 2017 work. No significant degradation was noted that would cause the intake to not be able to perform its intended function. The remaining Unit 1 intake structure inspection was subsequently scheduled and completed in 2018.

Although independent spent fuel storage facility structures inspections are outside the scope of the *Structures Monitoring* AMP, this example provides objective evidence that identified programmatic deficiencies involving inspection planning and implementation are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct deficiencies.

3. Condition monitoring inspections of structures included in the scope of the License Renewal Rule are required to be performed on a nominal five year interval. Results of ongoing civil structures inspections are documented and represent Oconee plant specific operating experience.

   The inspection results for the different inspections in the same structures and areas are collated so that current inspection results can be compared to previous inspection results. It was confirmed that the site structures monitoring and FERC inspections were completed on at least a nominal 5 year frequency. Degradation of structures and structural elements was identified in different areas included under the structures monitoring and FERC inspections. The degradation is recorded, compared to previous results, reviewed and evaluated by qualified personnel, and significant degradation is entered into the corrective action program to initiate corrective actions such as repairs or replacements, more frequent inspections, more detailed evaluations, or design changes. Inspections of structural elements were performed using divers and by dewatering the structures. The review of the inspection results and issues in the corrective action program determined that: 1) degradation was identified and documented; 2) structural repairs are performed under the corrective action program; 3) accessible areas are inspected nominally every five years; and 4) inaccessible areas are evaluated. Ongoing inspections and evaluations have not revealed results that would challenge an intended function. The performance of inspections and evaluation of issues in the corrective action program have resulted in the effective implementation of the aging management program.

   Oconee water-control structure inspection results demonstrate that inspections are being performed in accordance with industry guidelines and that those inspections are effective in identifying aging effects prior to loss of intended function. Pertinent examples of ONS civil structure inspection results are included in OE examples 4 through 6 below. These OE examples demonstrate that continued implementation of the *Inspection of Water-Control Structures Associated With Nuclear Power Plants AMP* will assure that the structures and components within the scope of the program will continue to perform their intended functions during the SPEO.

4. In 1998, a spall was identified during the diver inspection in the Unit 2 condenser circulating water intake structure pump pit. A temporary steel plate was installed during the inspection until permanent repairs could be performed. In 2001, the concrete was repaired with an underwater grout repair. The structural calculation was updated to reflect the repair and it was determined that repair did not result in a loss of capacity. Subsequent inspections cover this same area provide for continuing inspection to allow for identification of any future degradation of the repair or of the structural elements in the same areas. Degradation of the grout repair was not identified.

   OE example 4 provides objective evidence that below water inspections are performed using divers, degraded areas are identified, the degraded conditions are evaluated, corrective actions selected, corrective actions are taken to correct degraded conditions, and follow-up inspections are performed to continue monitoring the structure after a repair.

5. The sheet piles at the exterior of the condenser circulating water intake structure are within the scope of the inspections performed under this AMP. The sheet piles were previously coated with coal tar epoxy. The coating on the sheet piles on the north side of the road is mostly intact with minimal corrosion. Very little coating remains on the sheet piles on the south side of the access road. Visual inspections first documented localized corrosion of the sheet piles in 1997 and recorded the approximate percentage of the degraded surface. In 2006, ultrasonic test measurements were taken of the 0.375” thick material and smallest thickness found was 0.370”. The loss of 0.005” of the material thickness was assessed and it was determined to be not a concern. In 2016, additional ultrasonic test measurements were taken on the south sheet piles. The thicknesses were variable due to the localized nature of the corrosion with the smallest value being 0.348”. A nominal rate of loss was determined based upon the smallest localized thickness that was identified. The nominal rate of loss was used to estimate the minimum expected reading at the time of the next inspection, performed five years later in 2021. The minimum expected remaining thickness of the sheet pile was determined to be acceptable.

   OE example 5 provides objective evidence that the existing AMP effectively monitors and manages the condition of structures, more detailed inspections are performed when needed, and inspection records allow for the recommended trending of inspection results, and that conclusions are made regarding the ability of the structure to perform its intended function considering on-going degradation.

6. Alkali-silica reaction issues at Keowee dam have been identified and their impacts evaluated, with corrective actions taken to ensure to the safe and reliable operation of the spillway gates. The alkali-silica reaction investigations have characterized the alkali-silica reaction induced change in volume of the concrete, evaluating their impacts on operation of the spillway gates, and planning and implementing monitoring and mitigation measures.

There is documented movement of the spillway abutment walls and piers attributed to alkali-silica reaction. Monitoring points, bridge monuments and tell-tale gages are used to monitor movement. These points indicate continued vertical and horizontal movement. The piers and walls have some pattern cracking and efflorescence; however, the concrete looks to be structurally sound and serviceable.

Tainter gate guide rollers were removed in 1987 due to gates binding during operation. A gate experienced binding problems during full opening tests in 1993 and 1997. As a result of this binding, Duke initiated a survey of the spillway. The results of this survey confirmed that at several elevations, the gate was slightly wider than the bay width, which was attributed to alkali-silica reaction induced expansion of the concrete. In 2000, the embedded gate guides of the same gate were machined to remove areas that were causing the binding.

During the 2001 gate operating tests, contact between the gate and the embedded guide plates caused gate binding. Similar binding problems had been experienced with another gate, which is located at the right end of the spillway structure. Further investigation of the binding problem determined that the two end walls have moved inward. A survey monitoring program was established in 2002, to evaluate the rate of movement. The spillway abutment walls and piers had been included in the deformation surveying program since 1991.

In 2003, gate binding problems were again experienced. Inspection of the hoist shaft indicated movement of the right wall, which required the shaft to be removed and shortened. The binding of this gate was resolved in 2004 by removing and reinstalling the guide plates, increasing the clearance by recessing the guide plates into the pier and end wall, and replacing the gate seals.

Issues associated with gate operations were discussed during the seventh FERC Part 12D safety inspection and the potential failure modes analysis performed in 2006. A threshold of 0.75” of additional spillway end wall movement was established as part of the potential failure modes analysis. If exceeded, the threshold would trigger the need for further assessment and possible remediation. Ten monuments (five on each abutment wall) were added to the spillway monitoring network to enhance the existing system. These monuments were added as a result of the alkali-silica reaction investigations and recommendations from the Part 12 and potential failure modes analysis reports completed in 2006.

In 2008, the movement threshold on the spillway abutment walls was exceeded. A four-phase plan was established to further investigate and evaluate the abutment wall movements. The phases of the plan are:

- Phase I – Scope
- Phase II – Testing and Evaluation
- Phase III – Design of Remedial Actions
- Phase IV – Implementation

Phase I provided the scoping for performing 17 investigative tasks.

Phase II was the execution included drilling, sampling, borehole imaging, compression testing, petrographic testing, in-situ stress testing by overcoring, biaxial modulus testing, and stress calculation. This phase provided an understanding of the movements of the end walls, concluding that the alkali-silica reaction expansion of the mass concrete was the cause. The investigations found that no significant deterioration of the spillway concrete had occurred. The principal concern is the long-term reliability of the gates. Results of the testing indicated that the alkali-silica reaction could continue for the foreseeable future.

Phase III of the plan encompasses the design of remedial actions. The most viable solution was determined to be providing additional operating/travel clearance. There are no reliable methods to stop or retard the alkali-silica reaction process, so accommodating the movements is the most practical solution. Phase II provided information on anticipated rates of movement, so planning for future mitigation measures is feasible. The earlier side seal modifications involved resetting the seal plates deeper into the piers and end walls. Because of the heavy reinforcing steel, it is not feasible to further recess these plates. As a result, modifications to the gates themselves is the likely remediation for continued wall movement. For now, monitoring data and visual inspections are being used to guide the implementation schedule for phases III and IV.

The spillway has factors of safety that exceed the FERC criteria and has demonstrated its stable behavior for many years. The only factor that might change with time is the effects of alkali-silica reaction concrete growth; however, the impacts of alkali-silica reaction are more of an operational concern related to the radial gates, not a stability concern. No structural deterioration of the spillway concrete, such as loss of strength or significant cracking, has been noted during the alkali-silica reaction investigations.

OE example 6 provides objective evidence that the existing AMP effectively monitors and manages the condition of structures, degradation is identified and evaluated, degradation mechanisms are determined, more detailed inspections and monitoring are performed when needed, material testing is used to determine the impact of aging effects on materials, inspection records allow for the recommended trending of inspection results, numerical acceptance criteria are developed, and that conclusions are made regarding the ability of the structure to perform its intended function considering on-going degradation.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Inspection of Water-Control Structures Associated with Nuclear Power Plants* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, re-evaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Inspection of Water-Control Structures Associated with Nuclear Power Plants* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Inspection of Water-Control Structures Associated With Nuclear Power Plants* AMP as a subset of the *Structures Monitoring* (B2.1.33) AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.35 PROTECTIVE COATING MONITORING & MAINTENANCE

Program Description

The *Protective Coating Monitoring and Maintenance* AMP is an existing mitigative and condition monitoring program which manages loss of coating integrity of service level I coatings inside the primary containment (as defined in NRC RG 1.54) in air-indoor uncontrolled and treated water environments. The failure of the service level I coatings could adversely affect the operation of the emergency core cooling systems by clogging the emergency core cooling systems suction strainers. Proper maintenance of the service level I coatings ensures that coating degradation will not impact the operability of the emergency core cooling systems. The *Protective Coating Monitoring and Maintenance* program includes coating system selection, application, inspection, assessment, maintenance, and repair for any condition that adversely affects the ability of service level I coatings to function as intended. Evaluations are performed for test or inspection results that do not satisfy established criteria and the conditions are entered into the corrective action program.

Service level I coatings prevent or minimize the loss of material due to corrosion, but these coatings are not credited for managing the effects of corrosion for the carbon steel containment shells and components. This program ensures only that the service level I coatings maintain adhesion so as to not affect the intended function of the emergency core cooling systems suction strainers.

The program also provides controls over the amount of unqualified coatings. Unqualified coating may fail in a way to affect the intended function of the emergency core cooling systems suction strainers. Therefore, the quantity of unqualified coating is controlled to ensure that the amount of unqualified coating in the primary containment is kept within acceptable design limits.

NUREG-2191 Consistency

The *Protective Coating Monitoring and Maintenance* program is an existing program that will be consistent with NUREG-2191, Section XI.S8, *Protective Coating Monitoring and Maintenance*, as modified by SLR-ISG-Structures-2021-03-STRUCTURES, *“Updated Aging Management Criteria for Structures Portions of the Subsequent License Renewal Guidance”* with the enhancement described below.

Exception to NUREG-2191

None

Enhancements

The following enhancement will be implemented in the following program elements: Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), and Acceptance Criteria (Element 6).

1. Procedures will be enhanced to explicitly state peeling and physical damage are considered in the condition assessment. (Element 3)

2. Procedures will be enhanced to reference ASTM D5163-08. (Element 3, 4, 5 and 6)

<u>Operating Experience</u>

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Protective Coating Monitoring and Maintenance* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In August 2018 the Oconee nuclear coatings program was audited and several documentation issues were identified related to the program that warranted corrective actions to ensure compliance with procedure requirements.

   The audit identified that a coating deviation request form related to a component installed in the Oconee Unit 2 containment was not in permanent records as required. The hard copy of the coating deviation request form was located and was submitted to the station QA document repository for retention. Additionally, an extent of condition was performed to ensure all coating deviation records were being stored in accordance with requirements. All required records were accounted for.

   Additionally, the audit identified the Oconee Unit 1 primary containment coatings conditions assessment form had been completed and the hard copy of the document was available, but was not correctly filed with the initiating work order package documentation for retention.

   The calculation tracking containment debris inventory was identified as not being updated after each refueling outage based on the containment coatings condition assessments performed, which identify degraded qualified coatings, the quantity of non-qualified coatings in containment, and coating repairs and replacement. Significant margins for quantity of degraded and non-qualified coatings in all containments were maintained and tracked, however, the tracking calculation was not updated after each refueling outage as required. A cause evaluation identified misinterpretation of documentation requirements by the responsible engineer and organizational changes that shifted responsibility for some documentation aspects of the inspections from a fleet organization to the site as contributing causes. The calculation was updated to incorporate the missing information and documentation requirements discussed with responsible individuals to ensure understanding.

   OE example 1 provides objective evidence that age-related inspection findings are entered into the corrective action program and appropriate corrective actions are taken to evaluate and correct deficiencies. The audit corrective actions ensured the program documentation was brought up to date, and procedures and model work order instructions were updated to eliminate confusion related to documentation requirements.

The program corrective actions have been effective and demonstrated in subsequent outages. The inspections have been carried out in accordance with station procedures and the documentation has been submitted for retention.

2. Recent reactor building coating assessments performed on Oconee Units 1, 2, and 3 demonstrate the effectiveness of the *Protective Coating Monitoring and Maintenance* program.

   The scheduled Oconee Unit 1 reactor building coatings assessment was performed during the October 2018 outage in accordance with the primary containment coatings condition assessment procedure. The assessment identified 76 square feet of new degraded coating and documented 91 square feet of coating that was remediated. The total amount of degraded coated remaining in the Oconee Unit 1 containment was 1410 square feet, with significant margin to the calculated limit for the performance of emergency core cooling sump. The coating assessment documentation was submitted for retention with the work order document package and work requests were initiated in the work management system to plan the remediation of the newly identified degraded coatings.

   The scheduled Oconee 2 reactor building coating assessment was performed during the October 2019 outage in accordance with the primary containment coatings condition assessment procedure. The assessment identified 152 square feet of new degraded coating and documented 54 square feet of coating that was remediated. The total amount of degraded coated remaining in the Oconee 2 containment was 3654 square feet, with significant margin to the calculated limit for the performance of emergency core cooling sump. The coating assessment documentation was submitted for retention with the work order document package and work requests were initiated in the work management system to plan the remediation of the newly identified degraded coatings.

   The scheduled Oconee 3 reactor building coating assessment was performed during the April 2020 outage in accordance with the primary containment coatings condition assessment procedure. The assessment identified 20 square feet of new degraded coating and documented 28 square feet of coating that was remediated. The total amount of degraded coated remaining in the Oconee 3 containment was 3135 square feet, with significant margin to the calculated limit for the performance of emergency core cooling sump. The coating assessment documentation was submitted for retention with the work order document package and work requests were initiated in the work management system to plan the remediation of newly identified degraded coatings.

   OE example 2 demonstrates that inspections of service level I coatings inside the primary containment are being performed in accordance with requirements and that those inspections are effective in managing loss of coating integrity. The actions from the audit performed in 2018 were implemented and have incorporated into the program demonstrating the effectiveness of the Oconee corrective action program to effect change on AMPs.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Protective Coating Monitoring and Maintenance* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Protective Coating Monitoring and Maintenance* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

<u>Conclusion</u>

The implementation of the *Protective Coating Monitoring and Maintenance* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.36 ELECTRICAL INSULATION FOR ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

Program Description

The *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is an existing condition monitoring program that will continue to manage the aging effect of reduced insulation resistance of accessible electrical cable and connection insulation in adverse localized environments. This AMP is the portion of the existing Oconee UFSAR 18.3.14 *Insulated Cables And Connections* AMP for initial LR that includes accessible insulated cables and connections within the LR scope that are installed in adverse localized environments within in-scope structures and which could be subject to the environments' applicable aging effects from heat, radiation, and moisture. An adverse localized environment is defined as a condition in a limited plant area that is significantly more severe than the specified service condition for the cable or connection. This program does not include insulated cables and connections that are in the *Environmental Qualification* (B3.3) program.

At least once every ten years, accessible insulated cables and connections installed in adverse localized environments are visually inspected for jacket surface anomalies such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination. Surface anomalies are indications that can be visually monitored to preclude the conductor insulation applicable aging effect. The inspections acceptance criteria is no unacceptable, visual indications of jacket surface anomalies which suggest that a conductor insulation applicable aging effect may exist that could lead to a loss of the LR intended function, as determined by engineering evaluation. As part of the periodic inspections, previously identified and mitigated adverse localized environments' cumulative aging effects applicable to in-scope cable and connection insulation will be reviewed to confirm that the insulation's intended functions continue to be supported during the SPEO.

If testing is evaluated to be necessary after visual inspections identify degraded or damaged conditions (e.g. unacceptable surface anomalies) that may adversely affect the performance of cable or connection insulation intended functions, then proven tests applicable to condition monitoring of the insulation are performed (e.g., thermography may be included). For a large number of cables identified as degraded, a sample population will be tested. Testing as part of an existing maintenance, calibration, or surveillance program may be credited. Test results are to be within the acceptance criteria, as identified in Oconee procedures.

Further investigation will be performed on cables and connections per the corrective action program when the acceptance criteria is not met. Corrective actions may include, but are not limited to, testing, shielding or otherwise changing the environment, relocating or replacement. When an unacceptable condition is identified, a determination will be made as to whether this same condition could be applicable to other cables and connections.

NUREG-2191 Consistency

The *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is an existing program that will be consistent with the ten elements of AMP XI.E1, "*Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements*" specified in NUREG-2191 (GALL-SLR) with enhancements described below.

Exception to NUREG-2191

None

Enhancements

The following enhancements shall be implemented in the respective program elements: Parameters Monitored or Inspected (Element 3), and Detection of Aging Effects (Element 4), and Acceptance Criteria (Element 6)

1. As part of the periodic inspections, add review of previously identified and mitigated adverse localized environments' cumulative aging effects applicable to in-scope cable and connection insulation to confirm that the insulation's intended functions continue to be supported during the SPEO. (Elements 3 and 4)

2. Add a description of potential testing and its sampling: If testing is evaluated to be necessary after visual inspections identify degraded or damaged conditions (e.g. unacceptable surface anomalies) that may adversely affect the performance of cable or connection insulation intended functions, then proven tests applicable to condition monitoring of the insulation are performed (e.g., thermography may be included). For a large number of cables identified as degraded, a sample population will be tested. The sample size will be 20% of each affected cable and connection type with a maximum sample size of 25. Among the factors to consider for developing the test sample population are cable or connection type, environment, voltage level, circuit loading, and insulation material which is the most important factor per EPRI guidance. Testing as part of an existing maintenance, calibration, or surveillance program may be credited. The basis for the sample selection shall be documented. (Element 4)

3. Add acceptance criteria for potential testing of accessible cables and connections with unacceptable visual inspection results to the Oconee AMP description: Test results are to be within the acceptance criteria, as identified in the Oconee procedures. (Element 6)

Operating Experience

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the Oconee *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In September 2019, a self-assessment was performed for the existing *Insulated Cables and Connections* AMP (UFSAR 18.3.14), as part of a *"License Renewal Aging Management Programs"* self-assessment. The existing AMP includes elements of the *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program and the *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program. No areas for improvement findings were identified for the *Insulated Cables and Connections* AMP. One relatively less significant opportunity for improvement on AMP documentation that was generic to all the assessed AMPs was applicable to the *Insulated Cables and Connections* AMP in that model work orders were found to include outdated standards and engineering owner names. The opportunity for improvement was entered into and addressed in the corrective action program.

   OE example 1 provides objective evidence that the program critically assesses program performance to ensure all current LR commitments are being satisfied, and that the program self-identifies actions to support continuous improvement.

2. From September 2009 to April 2012, initial baseline visual inspections of accessible cables and connections were performed as required by the initial renewed operating license. Included in the inspections scope was the identification of surface anomalies in cable jackets and connector coverings that are accessible, i.e. can be viewed from floor level without ladders or scaffolding and without opening enclosures. The areas inspected were based on a 100% walk-down of Oconee Units 1, 2, and 3 plant areas and structures, e.g. in reactor buildings, auxiliary buildings, turbine buildings, standby shutdown facility, Keowee hydroelectric station, among other areas. Such total-of-area approach is conservative versus acceptable limitation of inspections to predetermined bounding adverse localized areas. Although more housekeeping and configuration issues were discovered, the following two conditions were identified, prior to a loss of circuit function, as being linked to aging-related degradation within the scope of the existing *Insulated Cables and Connections* AMP:

   a) A jacketed (liquid-tight) flexible conduit to a heater drain limit switch was found touching a non-insulated portion of steam pipe. The heat-degraded flex conduit was replaced and rerouted away from the pipe heat source to prevent future heat degradation. The internal wiring insulation was not identified as being similarly degraded.
   b) Heat shrink tubing and rubber insulation covering the interface between some pressurizer heater cables and connectors was found to be cracking at the (adverse localized environment) location closest to the pressurizer heater. In some cases, the tubing was no longer shrunk securely around the cable. The degradation did not immediately threaten functionality, as the cables and connections themselves did not show evidence of heat deterioration. The tubing was replaced, precluding a potential loss of intended function.

   OE example 2 demonstrates the effective use of the existing AMPs periodic visual inspections of accessible cables and connections exposed to adverse localized environments caused by heat, radiation, or moisture to identify insulation aging-related degradation prior to loss of intended function.

3. From May 2018 to November 2019, portions of the ten year walkdown visual inspections were performed in the Units 1, 2, and 3 reactor buildings and in the standby shutdown facility. Although more housekeeping and configuration issues were discovered (e.g. trash in tray, interlocked armor separated or pulled loose from a cable armor terminator outside an enclosure), there were no instances of identified cable or connection jacket or insulation aging-related degradation. At a Unit 1 electrical penetration, a group of small diameter non-SLR-scope instrumentation cables were found with corrosion (rust) on the exterior braided metallic armor; but no polymer jacket or insulation degradation was identified. One Unit 2 non-safety related cable's jacket was found with a few small apparently partial melt spots that did not expose the underlying steel armor, that did not require repair or challenge functionality, and that indicated discrete, minor installation or maintenance damage versus aging from an adverse localized environment.

   OE example 3 demonstrates the ongoing effective use of the existing AMP's periodic visual inspections of accessible cables and connections exposed to adverse localized environments caused by heat, radiation, or moisture to identify insulation aging related degradation prior to loss of intended function.

4. In June 2012, a focused self-assessment was performed for Oconee LR phase 2 readiness. The assessment team reviewed the existing *Insulated Cables And Connections* AMP, which includes elements of the *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP and the *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP. Accessible cable and connections walkdown inspections in the reactor buildings, auxiliary buildings, turbine buildings, standby shutdown facility, Keowee hydroelectric station, and other areas had all been performed and well documented in sufficient detail (e.g. typed notes, action requests, work requests, and work orders). Engineering calculations to further formalize the results, commitments, and other documentation were still being quality-verified at the time of assessment but were completed shortly thereafter.

   OE example 4 demonstrates the use of self-assessments to evaluate existing AMP related inspections and documentation for identifying and resolving cable jacket and insulation aging-related degradation that could lead to a loss of intended function.

5. In November 2012, neoprene jackets on two safety related low-voltage cables were found deteriorated to the point of some jacket material broken away from the underlying armor due to exposure to a suspected nearby heat source. Such loss of outermost jacket material does not and did not prevent the cables from being able to perform their intended functions. However, the jacket aging can indicate the potential aging of the internal conductors' ethylene-propylene rubber insulation which has superior temperature aging resistance and is also not nearly as exposed to adverse localized environments versus the neoprene jacket. Therefore, electrical insulation resistance tests (at over 4 times nominal operating voltage) were performed on both cables, leading to only a jacket repair covering on one cable and a spliced-in new cable section (without the obsolete neoprene material) on the other.

OE example 5 demonstrates good maintenance behavior and awareness during non-AMP activities to identify aging-related cable jacket deterioration that could lead to electrical insulation aging related degradation. OE example 5 also provides objective evidence that existing Oconee maintenance practices and the corrective action program are effective to identify and resolve aging-related degradation prior to a loss of intended function.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

<u>Conclusion</u>

The implementation of the *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.37 ELECTRICAL INSULATION FOR ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS USED IN INSTRUMENTATION CIRCUITS

Program Description

The *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits* AMP is a new performance monitoring program that will manage the effects of reduced insulation resistance of non-EQ cable and connection insulation in instrumentation circuits with sensitive, high voltage, low level current signals and that are subjected to adverse localized environments caused by temperature, radiation, or moisture. The AMP will apply to the in scope non-EQ portions of circuits in the area radiation monitoring system (e.g. high range containment area radiation monitors) and the neutron flux monitoring nuclear instrumentation system.

Exposure of electrical cables to adverse localized environments can result in reduced insulation resistance, which increases leakage current between insulated conductors or from insulated conductors to ground. Reduced insulation resistance is a concern for circuits with sensitive, high voltage, low level current signals because reduced insulation resistance may contribute to signal inaccuracies.

Reduced insulation resistance caused by severe degradation in the cable insulation can be detected by periodically reviewing past calibration or surveillance results before losing the cable or connection intended function. Regular calibration or surveillance testing is already performed for in scope instrumentation circuits. When the non-EQ cables and connections are included as part of the calibration or surveillance circuit, this AMP will periodically review and evaluate the past calibration or surveillance results (since the last review) to identify the existence of cable and connection insulation aging related degradation. The reviews will be completed before the SPEO and at least once every ten years, thereafter.

As an alternative to reviewing calibration or surveillance results, or when the non-EQ cables and connections (cable systems) are not included as part of the calibration or surveillance, a proven cable system test will be performed for the in-scope circuits. Such test will be judged effective in detecting deterioration in the cable system insulation. If credited for this AMP’s implementation, the cable system tests will be performed before the SPEO and thereafter at a frequency based on engineering evaluation but at least once every ten years.

NUREG-2191 Consistency

The Oconee *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits* AMP is a new program that, when implemented, will be consistent with NUREG-2191, Section XI.E2, Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits.

Exception to NUREG-2191

None

Enhancements

None

Operating Experience

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits* AMP will be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO.

1. In September 2013, an action request was initiated in the corrective action program identifying the unavailability of a Keithley Electrometer required to perform power range neutron detector leakage resistance and voltage response testing. ONS decided not to directly replace the obsolete Keithley Electrometer, but instead use a contracted service for an industry best practice of CHAR testing; a combination of time domain reflectometry and current/voltage curve results testing, which detects circuit capacitance and series and shunt impedances, including insulation resistance.

   OE example 1 demonstrates Oconee use of OE from the corrective action and preventive maintenance programs and industry involvement to apply new or improved test techniques applicable to this AMP that are effective in detecting age related degradation of sensitive, high voltage, low level current signal instrumentation cable and connection insulation.

2. In November 2013, an action request was initiated in the corrective action program identifying an issue in the Unit 3 nuclear instrumentation power range (3NI-5) channel measurements. Power range indications were swinging between 99.6% and 96.6% reactor power per neutron flux detection. CHAR tests (time domain reflectometry and current/voltage curve) were performed on all three triaxial cables for this detector (two signal cables and one high voltage power supply cable). The tests found a high impedance location (unspecified whether series or shunt such as insulation resistance) at either the triaxial connector of the ‘top’ signal cable or the E4 penetration feed-through on the inside containment end. A subsequent CHAR test on the isolated signal cable verified that the 3NI-5 measurements stabilized after a replacement triaxial connector was installed and the connection location was moved within the penetration enclosure.

   OE example 2 demonstrates the effectiveness of the corrective action program and this AMP’s test techniques for detecting degradation in sensitive, high voltage, low level current signal instrumentation cables and connections.

3. In December 2013, an action request was initiated in the corrective action program identifying an issue in the Unit 2 nuclear instrumentation (2NI-6) channel measurements. The 2NI-6 channel measurements were found not tracking with the other three reactor power range channels. Losing operation of one channel does not lose the nuclear instrumentation function. CHAR testing (time domain reflectometry and current/voltage curve) identified and located an open connection between the power supply triaxial cable and the detector connector underneath the canal seal plate. In the subsequent refueling outage, the cause was determined to be a poor solder contact on the center conductor in the connector at the detector end of the power supply triaxial field cable in the reactor building. Along with the replacement connector installation, CHAR testing of all three 2NI-6 cables in that outage verified no extent of condition in the two signal triaxial cables. Other similar channel circuits had been operating reliably for much longer periods than 2NI-6.

   Although not finding age-related degradation of insulation, OE example 3 demonstrates the effectiveness of the corrective action program and this AMP's techniques for detecting high voltage, low level current instrumentation cable and connection degradation that could lead to a loss of intended function.

4. In July 2014, an action request was initiated in the corrective action program identifying an issue in the Unit 3 nuclear instrumentation (3NI-7) channel measurements. The 3NI-7 channel measurements were found to be 'drifting' from the other three power range channels. Although the drift was in the conservative direction and was still within surveillance requirements, calibration was requested. Historical data through approximately three fuel cycles (six years) was reviewed to find that 3NI-7 had shown a pattern of faster drift compared to the other three channels. The relative drift was more prominent in the beginning of the fuel cycles; and the 3NI-7 readings became more precise with the other channels as the cycle continued. The data review found that the drift had been questioned and investigated previously in other action requests, in one case with operability confirmed by the drift again being in the conservative direction (higher than actual value) and by calibration being successfully completed within procedure tolerance with no other issues besides increased calibration frequency. The history also indicated that the 3NI-7 conservative drift occurred both before and after associated reactor protection system cabinet electronics were replaced. It was ultimately concluded that the drift was due to this particular channel's neutron detector response characteristics.

   OE example 4 demonstrates the effectiveness of the corrective action program and the use of historical calibration or other measurements data review to determine the condition of sensitive, high voltage, low level current signal instrumentation circuits. Such historical calibration or surveillance review will be similarly applied in this AMP (when the cable is included) to detect cable and connection insulation age related degradation that may lead to the loss of intended function.

5. In March 2019, an action request was initiated in the corrective action program documenting a Unit 3 Control Room operator aid computer alarm received for the high range containment area radiation monitor (3RIA-57). Recent and historical review of operator aid computer data showed that this detector had periodically spiked and returned to normal. The

response of 3RIA-57 was indicative of an invalid reading during source check because the indication quickly rose (spiked) and then decayed away. Further, investigation, testing and troubleshooting determined that the problem was caused by faulty connection assemblies, which were repaired to correct the issue.

Although not directly attributed to the cable or connection insulation aging (especially since the cables are not routed in the reactor building beyond the penetrations), OE example 5 demonstrates that the existing corrective action program and maintenance testing and inspections applicable to this AMP effectively identify and resolve degradation of sensitive, high voltage, low level current signal instrumentation cable that could lead to a loss of intended function.

The above OE examples provide objective evidence that the aging management activities and methods to be implemented by the *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the ONS *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.38 ELECTRICAL INSULATION FOR INACCESSIBLE MEDIUM-VOLTAGE POWER CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

Program Description

The *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is an existing condition monitoring program that will continue to manage the aging effect of reduced electrical insulation resistance due to exposure to significant moisture. The program is comprised of the inaccessible medium-voltage cable portion of the existing condition monitoring program, *Insulated Cables And Connections* program.

This AMP applies to the electrical insulation for inaccessible (e.g., underground in buried conduit, embedded ducts or conduits (e.g. duct banks), trenches, vaults, manholes, or direct buried) non-EQ medium-voltage power cables (operating voltage of 2kV to 35kV) within the scope of SLR that are potentially exposed to significant moisture. For this program, significant moisture is defined as exposure to moisture that lasts more than three days (i.e., long-term wetting or submergence over a continuous period) that if left unmanaged, could potentially lead to a loss of intended function.

Periodic actions are taken to prevent in-scope inaccessible medium-voltage power cables from being exposed to significant moisture. Water collection in accessible trenches (e.g. low points) and conduit manholes containing in-scope medium-voltage cables and conduit ends is monitored via documented inspections, and the water removed as needed. The inspection frequencies have been established based on Oconee OE over time and do not exceed a one year interval. Inspections and dewatering will also be performed after event-driven occurrences such as heavy rain, rapid thawing of heavy ice and snow, or flooding. The inspections are performed to confirm that in-scope medium-voltage power cables are not submerged, cable/splices and cable support structures are intact, and de-watering systems (e.g., sump pumps and drains) and associated alarms operate properly.

The issued NRC SLR-ISG-2021-04-ELECTRICAL revises NUREG-2191 XI.E3A to allow for less frequent (five year) periodic manhole inspection. This relaxation is not applicable unless or until the SLR-ISG described self-monitored manhole water level indication and alarms are installed and implemented at Oconee.

In-scope non-EQ inaccessible medium-voltage cables found to be exposed to significant moisture are tested to detect reduced electrical insulation resistance, an indicator of insulation age-related degradation. The cable testing includes one or more proven methods, such as dissipation factor (‘tangent-delta’) or similar power factor, AC voltage withstand, partial discharge, step voltage, time-domain reflectometry, frequency-domain reflectometry, insulation resistance with or without polarization index, or other applicable and effective testing. Cables are tested at least once every six years. More frequent testing may occur based on test results and OE.

There are no submarine cables or other cables designed for continuous wetting or submergence currently in the scope of this program. Future installed cables of these potential designs would be considered for inclusion in this program, at least for a one-time test.

NUREG-2191 Consistency

The *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is an existing program that, following enhancement, will be consistent with the ten elements of AMP XI.E3A, *"Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"* specified in NUREG-2191 (GALL-SLR), as modified by SLR-ISG-2021-04-ELECTRICAL, *Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance*.

Exception to NUREG-2191

None

Enhancements

The following enhancements will be implemented in the following program elements: Preventive Actions (Element 2), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4) and Acceptance Criteria (Element 6).

1. Add inspections for water accumulation performed after event driven occurrences, such as heavy rain, rapid thawing of heavy ice and snow, or flooding (Element 2).

2. For the periodic water accumulation inspections, add documented verification that either automatic or passive drainage systems or manual pumping are effective in preventing medium-voltage cable exposure to significant moisture (Elements 2 and 6).

3. Remove from program descriptions the original 'significant voltage' portion of exposures to determine the inaccessible medium-voltage cables for testing (Element 3).

4. Revise the inaccessible medium-voltage cable testing and water accumulation inspection matrix to include inspection methods, test methods, and acceptance criteria (Element 4).

Operating Experience

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions are maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. A plant-specific OE search that was performed for 2009 through 2019 yielded one result indicating an in-service insulation failure of an in-scope inaccessible medium-voltage power cable due to aging from significant moisture. (See OE example #4 below.) Thus, the corresponding Oconee in-service failure rate is 1 failure per 3 reactors or 0.333 failures per reactor. This OE search result is fairly consistent with the previous searches for GL 2007-01 covering a broader history but focused on inaccessible power cables, for which Oconee reported one prior applicable inaccessible or underground power cable failure under test (i.e., none in-service) over Oconee's three unit history up to the GL. For the totality of the industry's response, GL 2007-01 Summary Report - Figure 24 indicates that 46 medium-voltage power cable failures with "water / moisture" as a definitive, probable, or possible causal factor were identified for the 104 applicable reactors, or an average of 0.442 failures per reactor. This industry failure rate could be further reduced since the summary report data included cables and failures beyond the scope of this AMP (e.g., not in SLR scope, test/non-service failures, or failures not attributed to insulation aging degradation).

   The above results demonstrate the low prevalence of applicable Oconee lost intended functions related to the *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP.

2. In July 2009, after discovery that two trench sump pumps had power inadvertently eliminated during a building demolition, it was recommended to perform quarterly inspections and water pumping (if needed) unless or until the sump pumps system could be permanently restored or replaced. The trench contains cables within the scope of the program. Preventive maintenance was enhanced to require inspections and as-needed pumping on a quarterly frequency.

   In April 2011, the water accumulation challenge in this trench was again noted as part of LR cable aging management walkdown inspections. That documentation indicated that the worst case water level remained below the medium-voltage cables suspended on wall supports well off the trench floor but that the underlaying low-voltage cables were exposed to submergence. Based on this OE, the preventive maintenance frequency was changed to monthly unless or until a permanent power restoration to sump pumps is implemented.

   OE example 2 provides objective evidence that the AMP manager critically self-assesses program performance and self-identifies actions that support continuous improvement.

3. In April 2020, Oconee received a green 10 CFR 50 non-cited violation for failure to identify and correct repeated cable submergence including two QA-1/safety related medium-voltage cables supplying normal power to the standby shutdown facility switchgear. Although the two cables of interest are not credited for standby shutdown facility event mitigation, they are designated as safety related. Corrective actions were initiated to evaluate the need to include the two standby shutdown facility medium-voltage cables in the cable AMP, to divert water from entering the common trench with standby shutdown facility cables, to promptly remove water from the common trench, to remove trash, dirt, and mud from the common trench, and to review operator rounds for the common trench to improve the prevention and monitoring of cable submergence therein.

OE example 3 provides objective evidence that deficiencies identified are entered into the corrective action program. The corrective action program is effective in evaluating and correcting degraded conditions. Continued implementation of the program will assure degraded conditions will be identified and corrected during the SPEO.

4. In December 2011, the Y-phase conductor faulted to ground in 1 of 7 parallel 4.16kV inaccessible cables in a trench between a transformer and switchgear for the standby buses. As part of an alternate station blackout recovery path, the faulted cable is within the scope of SLR. Per the existing *Insulated Cables And Connections* AMP, a Very-Low-Frequency Tangent-Delta test had been performed in June 2010 separately on each of the 3 phases of this circuit but with the conductors from the same phase of all 7 parallel cables connected together. The Y-phase test results indicated potential degradation and that ‘Further Study’ was needed. Therefore, a follow-up test was planned while contingency replacement components (e.g. cable and splices) were being obtained. However, the cable failure occurred before the re-test would have been performed.

   Oconee replaced the inaccessible section of cable using a splice at an indoor accessible location. Likely caused by installation damage, a cut was found through the faulted cable jacket to the armor near the fault exit hole location. An independent external lab determined that the insulation was locally degraded in a ten foot section by water-treeing, which is caused by long-term water ingress in the presence of an electric field. A lightning-strike voltage surge was the likely final stressor breaking down the degraded insulation to create the ground fault. Since the Tangent-Delta test is a global or average-condition test, localized age-related degradation can potentially be masked in varying degrees if testing very long or paralleled insulated and shielded conductors. The original 2010 Tangent-Delta test was remarkably effective in identifying the localized degradation in one cable, even though tested in parallel with six other ~1,500-foot cables. However, the re-test responses were not timely enough to prevent the fault.

   This OE contributed directly to the subsequent development of the fleet cable AMP implementation procedure by requiring, for paralleled conductors tested with unsatisfactory diagnostic results, that a withstand test should also be performed and that additional diagnostic tests must be on isolated individual insulated conductors. This OE also validates the effective sensitivity of the Tangent-Delta testing to detect insulation age-related degradation.

   OE example 4 provides objective evidence that plant-specific OE that potentially involves aging is evaluated and used to adjust the program as necessary. OE example 4 also demonstrates the use of the corrective action program to identify degraded conditions and take corrective action to ensure aging effects are identified.

5. In July 2012, a self-assessment for the LR phase 2 NRC inspection determined that the *Insulated Cable And Connections* AMP had exempted manholes in the turbine building basement since these manholes were not directly being exposed to rain water and surface runoff. Although that lack of direct outdoor exposure is true, these manholes can occasionally backfill from turbine building trenches. The assessment identified a history of water collection in some of these manholes and recommended that they be added to the AMP inspections. Corresponding inspections found over two feet of water in one of the

four manholes (which was found to have no drain), one inch in another of the manholes, and no standing water or cable submergence in the remaining two manholes. The manholes with standing water were initially added to the quarterly periodic inspections and pumping as needed until OE could establish a more permanent frequency; while the other two manholes were added to annual inspections. The permanent inspection frequency for the manhole that had experienced significant moisture and cable submersion was established to be a monthly basis.

OE example 5 demonstrates the use of self-assessment and the corrective action program to clarify and improve existing AMP related inspection scopes to prevent an environmental aging stressor (standing water for medium-voltage cables) that could lead to loss of an intended function.

6. In April 2014, Oconee successfully applied borescope technology to extend visual inspection capability as much as 130 feet beyond the ground surface collection points to a trench itself to improve verification of the trench drainage effectiveness. The trench contains in-scope Keowee emergency underground medium-voltage power and low-voltage instrument and control cables. The trench drainage verification inspection procedure was previously limited to visual examination of drain outlets, inspection ports, and drywell collections; and it lacked a means to inspect inside the trench itself. The results of the extended inspections showed no standing water and no evidence of degrading cables or structural supports. The Oconee maintenance procedure for the inspections was revised to regularly include use of a borescope camera to perform enhanced periodic trench drainage visual inspections.

   OE example 6 provides objective evidence that the program critically assesses program performance and identifies actions that support continuous improvement.

7. In June 2017, Oconee conducted a self-assessment on its implementation of the fleet Cable AMP to evaluate its inaccessible medium-voltage cable testing practices, some of which includes cables within the SLR scope per the existing Oconee *Insulated Cables And Connections* AMP. The self-assessment revealed that the periodic testing scope has nearly doubled from an initial 12 circuits largely due to the addition of protected service water major-project circuits. A second round of testing had already been completed for 10 circuits. A few tests identified degraded splices which prompted more frequent subsequent tests and eventual splice abandonment or replacements. One circuit's test detected significant age-related degradation within cable insulation itself (OE example 4 above). The self-assessment also confirmed that the preventive maintenance frequency for the periodic cable testing had been updated to at least once every six years versus original LR committed ten year frequency for both the original and added scope of medium-voltage circuits. The six year inspection frequency is consistent with NUREG-2191 guidance.

   OE example 7 demonstrates the use of self-assessment and provides objective evidence that industry OE involving aging is evaluated and used to adjust the program as necessary.

8. In September 2019, a self-assessment was performed for the existing *Insulated Cables And Connections* AMP (UFSAR 18.3.14), as part of a “LR AMPs” self-assessment. The existing program includes elements of the *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program and the *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program. No areas for improvement findings were identified for the *Insulated Cables And Connections* AMP. One relatively less significant opportunity for improvement on documentation that was generic to all the assessed programs was applicable to the *Insulated Cables And Connections* AMP in that model work orders were found to include outdated standards and program owner names. The generic opportunity for improvement was initiated and addressed in the corrective action program.

   OE example 8 provides objective evidence that the program critically assesses program performance to ensure all current LR commitments are being satisfied, and that the program self-identifies actions to support continuous improvement.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.39 ELECTRICAL INSULATION FOR INACCESSIBLE INSTRUMENT AND CONTROL CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

Program Description

The *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is a new condition monitoring program that will manage the aging effect of reduced electrical insulation resistance due to exposure to significant moisture. The AMP will apply to the electrical insulation for inaccessible (e.g., installed underground, in buried conduit, cable trenches, cable troughs, duct banks, vaults, manholes, or direct buried) non-EQ instrument and control cables and splices within program scope that are potentially exposed to significant moisture, including instrument and control cables designed for continuous wetting or submergence. For this program, significant moisture is defined as exposure to moisture that lasts more than three days (i.e., long term wetting or submergence over a continuous period) that if left unmanaged, could potentially lead to a loss of intended function. Cable wetting or submergence resulting from event driven occurrences and mitigated by either automatic or passive drains is not considered significant moisture for this AMP.

Periodic actions will be taken to prevent in scope inaccessible instrument and control cables from being exposed to significant moisture. Water accumulation in accessible conduit ends, manholes, and trenches (e.g. low points) containing in-scope instrument and control cables will be periodically monitored via documented inspections, and the water removed as needed. The inspection frequencies will be based on Oconee OE with cable wetting or submergence and with water accumulation over time. Inspections and dewatering will be performed at least once annually and after event driven occurrences such as heavy rain, rapid thawing of heavy ice and snow, or flooding. The first inspection for SLR will be completed prior to the SPEO. The inspections will be performed to confirm that in-scope instrument and control cables are not submerged, cable/splices and cable support structures are intact, and de-watering systems (e.g., sump pumps and drains) and associated alarms operate properly.

The issued NRC SLR-ISG-2021-04-ELECTRICAL revises NUREG-2191 XI.E3B to allow for less frequent (5-year) periodic manhole inspection. This relaxation is not applicable unless or until SLR-ISG described self-monitored manhole water level indication and alarms are installed and implemented at Oconee.

Accessible portions (e.g. in manholes) of in-scope inaccessible instrument and control cables will be visually inspected at least once every six years, coordinated with the water accumulation inspections, to assess observable jacket age-related degradation that may be indicative of electrical insulation age-related degradation. The inaccessible instrument and control cables that are found to be exposed to significant moisture will be evaluated to determine if testing is required. If testing is needed, then based on cable application and insulation material, one or more types of one-time testing of in-service samples is performed to assess the insulation condition. One-time test(s) will be performed on significant-moisture-exposed instrument and control cables whose insulation type is known from Oconee or industry OE to degrade with continuous exposure to moisture (e.g. Vulkene or Raychem cross-linked polyethylene). If testing is required, the specific type of test(s) will be a proven technique capable of detecting reduced insulation resistance of the cable’s insulation system due to wetting or submergence. Required one-time tests and the first visual inspections for SLR will be completed before the SPEO. The need for additional tests or inspections will be determined by the test or inspection results as well as Oconee and industry OE.

Testing of installed in-service inaccessible instrument and control cables as part of an existing maintenance, calibration or surveillance program, testing of coupons, abandoned or removed cables, or inaccessible medium or low voltage power cables subjected to the same or bounding environment, service application, cable routing, manufacturing and electrical insulation material may be credited in lieu of or in combination with direct testing of installed in-service inaccessible instrument and control cables when testing is required. A sampling methodology will be used when many inaccessible instrument and control cables exposed to significant moisture are evaluated as requiring testing.

NUREG-2191 Consistency

The *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is a new program that, when implemented, will be consistent with NUREG-2191, Section XI.E3B, *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements*, as modified by SLR-ISG-2021-04-ELECTRICAL, *Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance.*

Exception to NUREG-2191

None

Enhancements

None

Operating Experience

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be effective in managing aging effects for components within the scope of the program so that the intended functions are maintained consistent with the CLB for the SPEO.

1. A plant-specific OE search that was performed for 2009 through 2019 yielded no examples of degraded in-scope inaccessible instrument and control cable insulation that lost SLR intended function due to aging from significant moisture. This OE search result is consistent with the previous searches for GL 2007-01 covering a broader history but focused on inaccessible power cables, for which Oconee reported no applicable inaccessible or underground low-voltage power cable failures. For the totality of the industry's response, the GL 2007-01 summary report - figure 23 indicates that fourteen low-voltage power cable failures with "water/moisture" as a causal factor were identified for the 104 applicable reactors, or an average of 0.135 failures per reactor. The failure

rate could be further reduced since the Summary Report data includes cables and failures beyond the scope of this AMP (e.g., not in scope, test/non-service failures, or failures not attributed to insulation degradation).

The above results demonstrate the low prevalence of applicable Oconee lost intended functions related to the *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP.

2. In July 2009, after discovery that two trench sump pumps had power inadvertently eliminated during a building demolition, it was recommended to perform quarterly inspections and water pumping (if needed) unless or until the sump pumps system could be permanently restored or replaced. The trench contains cables within the scope of the program. Preventive maintenance was enhanced to require inspections and as-needed pumping on a quarterly frequency.

   In April 2011, the water accumulation challenge in this trench was again noted as part of LR cable aging management walkdown inspections. That documentation indicated that the worst case water level remained below the medium-voltage cables suspended on wall supports well off the trench floor but that the underlaying low-voltage cables were exposed to submergence. Based on this OE, the preventive maintenance frequency was changed to monthly unless or until a permanent power restoration to sump pumps is implemented.

   OE example 2 provides objective evidence that the AMP manager critically self-assesses program performance and self-identifies actions that support continuous improvement.

3. In July 2012, a self-assessment for the LR phase 2 NRC inspection determined that the *Insulated Cable And Connections* AMP had exempted manholes in the turbine building basement since these manholes were not directly being exposed to rain water and surface runoff. Although that lack of direct outdoor exposure is true, these manholes can occasionally backfill from turbine building trenches. The assessment identified a history of water collection in some of these manholes and recommended that they be added to the AMP inspections. Corresponding inspections found over two feet of water in one of the four manholes (which was found to have no drain), one inch in another of the manholes, and no standing water or cable submergence in the remaining two manholes. The manholes with standing water were initially added to the quarterly periodic inspections and pumping as needed until OE could establish a more permanent frequency; while the other two manholes were added to annual inspections. The permanent inspection frequency for the manhole that had experienced significant moisture and cable submersion was established to be a monthly basis.

   OE example 3 demonstrates the use of self-assessment and the corrective action program to clarify and improve existing AMP related inspection scope to prevent an environmental aging stressor (standing water for medium-voltage cables) that could lead to loss of an intended function.

4. In September 2012, during preparations to move underground cables to construct a new maintenance building, a concrete manhole was observed with water covering non-safety

related low-voltage cables. While the *Insulated Cables and Connections* AMP for the initial PEO required no action for inaccessible low-voltage cables, Oconee took the conservative position that the low-voltage cables should also be kept as dry as possible. Aware of broadening industry attention to inaccessible cables exposed to significant moisture, Oconee added periodic inspections and water removal, as needed, for this low-point manhole as a scheduled work activity in the work management system.

OE example 4 provides objective evidence that plant-specific and industry OE that potentially involves aging is evaluated and used to proactively adjust inspection and preventive maintenance practices as necessary.

5. In April 2014, Oconee successfully applied borescope technology to extend visual inspection capability as much as 130 feet beyond the ground surface collection points to a trench to improve verification of the trench drainage effectiveness. The trench contains in-scope Keowee emergency underground medium-voltage power cables and low-voltage instrument and control cables. The trench drainage verification inspection procedure was previously limited to visual examination of drain outlets, inspection ports, and drywell collections, and it lacked a means to inspect inside the trench itself. The results of the extended inspections showed no standing water and no evidence of degrading cables or structural supports. The Oconee maintenance procedure for the inspections was revised to regularly include use of a borescope camera to perform enhanced periodic trench drainage visual inspections.

   OE example 5 provides objective evidence that the program critically assesses program performance and identifies actions that support continuous improvement.

The above examples of OE provide objective evidence that the aging management activities and methods to be implemented by the *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.40 ELECTRICAL INSULATION FOR INACCESSIBLE LOW-VOLTAGE POWER CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

Program Description

The *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is a new condition monitoring program that will manage the aging effect of reduced electrical insulation resistance due to exposure to significant moisture. The AMP will apply to the electrical insulation for inaccessible (e.g., installed underground in buried conduit, cable trenches, cable troughs, duct banks, vaults, manholes, or direct buried) non-EQ low-voltage power cables and splices (operating voltage less than 2 kV) within the scope of SLR that are potentially exposed to significant moisture, including low-voltage power cables designed for continuous wetting or submergence. For this program, significant moisture is defined as exposure to moisture that lasts more than three days (i.e., long-term wetting or submergence over a continuous period) that if left unmanaged, could potentially lead to a loss of intended function. Cable wetting or submergence resulting from event driven occurrences and mitigated by either automatic or passive drains is not considered significant moisture for this AMP.

Periodic actions will be taken to prevent in-scope inaccessible low-voltage power cables from being exposed to significant moisture. Water accumulation in accessible conduit ends, manholes, and trenches (e.g., low-points) containing in-scope low-voltage power cables will be periodically monitored via documented inspections, and the water removed as needed. The inspection frequencies will be based on Oconee OE with cable wetting or submergence and with water accumulation over time. Inspections and de-watering will be performed at least once annually and after event driven occurrences such as heavy rain, rapid thawing of heavy ice and snow, or flooding. The first inspection for SLR will be completed prior to the SPEO. The inspections will be performed to confirm that in-scope low-voltage power cables are not submerged, cable/splices and cable support structures are intact, and de-watering systems (e.g., sump pumps and drains) and associated alarms operate properly.

The issued NRC SLR-ISG-2021-04-ELECTRICAL revises NUREG-2191 XI.E3C to allow for less frequent (five year) periodic manhole inspection. This relaxation is not applicable unless or until SLR-ISG described self-monitored manhole water level indication and alarms are installed and implemented at Oconee.

Accessible portions (e.g., in manholes) of in-scope inaccessible low-voltage power cables will be visually inspected at least once every six years, coordinated with the water accumulation inspections, to assess observable jacket age-related degradation that may be indicative of electrical insulation age-related degradation. The inaccessible low-voltage power cables that are found to be exposed to significant moisture will be evaluated to determine if testing is required. If testing is needed, then based on cable application and insulation material, one or more type(s) of one-time testing of in-service samples is performed to assess the insulation condition. One-time test(s) will be performed on significant moisture exposed low-voltage power cables whose insulation type is known from Oconee or industry OE to degrade with continuous exposure to moisture (e.g., Vulkene or Raychem cross-linked polyethylene). If testing is required, the specific type of test(s) will be a proven technique capable of detecting reduced insulation resistance of the cable's insulation system due to wetting or submergence. Required one-time tests and the first visual inspections for SLR will be completed before the SPEO. The need for additional tests or inspections will be determined by the test or inspection results as well as Oconee and industry OE.

Testing of installed in-service inaccessible low-voltage power cables as part of an existing maintenance, calibration or surveillance program, testing of coupons, abandoned or removed cables, or inaccessible medium-voltage power cables or instrument and control cables subjected to the same or bounding environment, service application, cable routing, manufacturing and electrical insulation material may be credited in lieu of or in combination with direct testing of installed in-service inaccessible low-voltage power cables when testing is required. A sampling methodology will be used when many inaccessible low-voltage power cables exposed to significant moisture are evaluated as requiring testing.

NUREG-2191 Consistency

The *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is a new program that, when implemented with exceptions below, will be consistent with NUREG-2191, Section XI.E3C, *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements*, as modified by SLR-ISG-2021-04-ELECTRICAL, *Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance*.

Exception 1 to NUREG-2191

The following program element(s) have exceptions:

Program Element Affected: Detection of Aging Effects (Element 4)

1. The fourth paragraph for Element 4 – Detection of Aging Effects in NUREG-2191 Section XI.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL-Appendix C, states the following:

   *"Testing of installed inservice low-voltage power cables as part of an existing maintenance, calibration or surveillance program, testing of coupons, abandoned or removed cables, **or inaccessible low-voltage power cables*** [emphasis added] *subjected to the same or bounding environment, inservice application, cable routing, manufacturing and insulation material may be credited in lieu of or in combination with testing of installed inservice inaccessible low-voltage power cables when testing is required in this AMP."*

   The above highlighted phrase; *"…or inaccessible low-voltage power cables…"* will be replaced by *"...or inaccessible medium-voltage power cables or instrument and control cables…"* for the ONS *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP.

Justification for Exception 1 to NUREG-2191:

The fourth paragraph for Element 4 – Detection of Aging Effects in NUREG-2191 Section XI.E3C states the following:

> *"Testing of installed inservice low-voltage power cables as part of an existing maintenance, calibration or surveillance program, testing of coupons, abandoned or removed cables,* ***or inaccessible medium voltage power cables or instrumentation and control cables*** [emphasis added] *subjected to the same or bounding environment, inservice application, cable routing, manufacturing and insulation material may be credited in lieu of or in combination with testing of installed inservice inaccessible low-voltage power cables when testing is required in this AMP."*

This exception to NUREG-2191 Section XI.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL-Appendix C will align the Detection of Aging Effects Element for this ONS AMP with the Detection of Aging Effects Element provided in NUREG-2191 Section XI.E3C [Reference 1.7-3]. This change will also align the Detection of Aging Effects Element for this ONS AMP to be consistent with Element 4 of NUREG-2191 Section XI.E3B, as modified by SLR-ISG-2021-04-ELECTRICAL. This change will continue to provide reasonable assurance that insulation material for electrical cables will perform its intended function for the SPEO.

Exception 2 to NUREG-2191

Program Element Affected: Corrective Actions (Element 7)

2. The second paragraph for Element 7 – Corrective Actions in NUREG-2191 Section XI.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL-Appendix C, will not apply to the ONS *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP. Specifically, the following will not apply for Appendix B2.1.40 AMP (GALL-SLR XI.E3C):

> *"Additional inspections are conducted if one of the inspections does not meet the acceptance criteria due to current or projected degradation (i.e., trending). The number of increased inspections is determined in accordance with the site's corrective action process; however, there are no fewer than two additional inspections for each inspection that did not meet the acceptance criteria. The additional inspections are completed within the interval (e.g., refueling outage interval, 10-year inspection interval) in which the original inspection was conducted. Additional samples are inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. At multi-unit sites, the additional inspections include inspections at all of the units with the same material, environment, and aging effect combination."*

Justification for Exception 2 to NUREG-2191:

As discussed in the summary of proposed revisions in the ISG, the proposed revisions to GALL-SLR XI.E3C add, at least every 5 years, inspection of manholes with water level monitoring and alarms that result in consistent and subsequent pump out of accumulated water prior to wetting or submergence of cable. Also for such equipped manholes, the proposed revisions add inspection of manholes following event-driven occurrences such as heavy rain, rapid thawing of ice and snow, or flooding, only when water level monitoring indicates water is accumulating. The proposed changes to Element 7, Corrective Actions were not discussed nor was the basis for the revision discussed.

The proposed change to Element 7 provides specific corrective actions regarding additional inspections if acceptance criteria is not met. The details provided by the proposed change are greater than those provided for other similar AMPs, including GALL-SLR XI.E3A and XI.E3B. This addition imposes an undue burden with no safety benefit.

To align corrective actions for this AMP with GALL-SLR XI.E3A and XI.E3B inaccessible cable insulation AMPs, Element 7 – Corrective Actions will be consistent with Element 7 of NUREG-2191 Sections XI.E3A and XI.E3B. As such, this AMP will address only the first paragraph for AMP Element 7 of NUREG-2191 Section XI.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL-Appendix C.

Enhancements

None

Operating Experience

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO.

1. A plant-specific OE search that was performed for 2009 through 2019 yielded no examples of an in-scope inaccessible low-voltage power cable insulation failure due to aging from significant moisture. Such search result is consistent with the previous searches for GL 2007-01 covering a broader history but focused on inaccessible power cables, for which Oconee reported no applicable inaccessible or underground low-voltage power cable failures. For the totality of the industry's response, the NRC GL 2007-01 summary report - figure 23 indicates that fourteen low-voltage power cable failures with "water/moisture" as a causal factor were identified for the 104 applicable reactors, or an average of 0.135 failures per reactor. This industry failure rate could be further reduced since the summary report data includes cables and failures beyond the scope of this SLR AMP (e.g., not in scope, test/non-service failures, or failures not attributed to insulation degradation).

OE example 1 demonstrates the low prevalence of applicable Oconee lost intended function events related to the *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP.

2. In July 2009, after discovery that two trench sump pumps had power inadvertently eliminated during a building demolition, it was recommended to perform quarterly inspections and water pumping (if needed) unless or until the sump pumps system could be permanently restored or replaced. The trench contains cables within the scope of the program. Preventive maintenance was enhanced to require inspections and as needed pumping on a quarterly frequency.

   In April 2011, the water accumulation in this trench was again noted as part of LR cable aging management walkdown inspections. That documentation indicated that the worst case water level remained below the medium-voltage cables suspended on wall supports well off the trench floor but that the underlaying low-voltage cables were exposed to submergence. Based on this OE, the preventive maintenance frequency was changed to monthly unless or until a permanent power restoration to sump pumps is implemented.

   OE example 2 provides objective evidence that the AMP manager critically self-assesses program performance and self-identifies actions that support continuous improvement.

3. In July 2012, a self-assessment for the LR phase 2 NRC inspection determined that the *Insulated Cable And Connections* AMP had exempted manholes in the turbine building basement since these manholes were not directly being exposed to rain water and surface runoff. Although that lack of direct outdoor exposure is true, these manholes can occasionally backfill from turbine building trenches. The assessment identified a history of water collection in some of these manholes and recommended that they be added to the AMP inspections. Corresponding inspections found over two feet of water in one of the four manholes (which was found to have no drain), one inch in another of the manholes, and no standing water or cable submergence in the remaining two manholes. The manholes with standing water were initially added to the quarterly periodic inspections and pumping as needed until OE could establish a more permanent frequency; while the other two manholes were added to annual inspections. The permanent inspection frequency for the manhole that had experienced significant moisture and cable submersion was established to be a monthly basis.

   OE example 3 demonstrates the use of self-assessment and the corrective action program to improve existing AMP related inspection scopes to prevent an environmental aging stressor (standing water for medium-voltage cables per existing Oconee program) that could lead to loss of an intended function.

4. In September 2012, during preparations to move underground cables to construct a new maintenance building, a concrete manhole was observed with water covering non-safety related low-voltage cables. While the initial LR's *Insulated Cables And Connections* AMP requires no action for inaccessible low-voltage cables, Oconee took the conservative position that the low-voltage cables should also be kept as dry as possible. Aware of broadening industry attention to inaccessible cables exposed to significant moisture,

Oconee added periodic inspections and water removal, as needed, for this low-point manhole.

OE example 4 provides objective evidence that plant-specific and industry OE that potentially involves aging is evaluated and used to proactively adjust inspection and preventive maintenance practices as necessary.

5. In April 2014, Oconee successfully applied borescope technology to extend visual inspection capability as much as 130 feet beyond the ground surface collection points to a trench to improve verification of trench drainage effectiveness. The trench contains in-scope Keowee emergency underground medium-voltage power cables and low-voltage instrument and control cables. The trench drainage verification was previously limited to visual examination of drain outlets, inspection ports, and drywell collections; and it lacked a means to inspect inside the trench itself. The results of the extended inspections showed no standing water and no evidence of degrading cables or structural supports. The Oconee maintenance procedure for the inspections was revised to regularly include use of a borescope camera to perform enhanced periodic trench drainage visual inspections.

   OE example 5 provides objective evidence that the program critically assesses program performance and identifies actions that support continuous improvement.

The above examples of OE provide objective evidence that the aging management activities and methods to be implemented by the *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

<u>Conclusion</u>

The implementation of the *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.41 METAL ENCLOSED BUS

Program Description

The *Metal Enclosed Bus* AMP is a new condition monitoring program that will manage the identified aging effects of in-scope metal enclosed bus. The internal portions of accessible bus enclosure assemblies will be visually inspected for age-related degradation, including cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The accessible bus insulation will be visually inspected for signs of reduced insulation resistance, such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination which may indicate overheating or aging degradation. The accessible internal bus insulating supports will be visually inspected for structural integrity and signs of cracks.

Metal enclosed bus external surfaces and external structural supports are managed by the *Structures Monitoring* (B2.1.33) AMP.

Accessible elastomers (e.g., gaskets, boots, O-rings and sealants) will be inspected for degradation including surface cracking, crazing, scuffing, dimensional change (e.g., “ballooning” and “necking”), shrinkage, discoloration, hardening or loss of strength.

A sample of accessible bolted connections will be inspected for increased resistance of connection by either performing thermography or measuring the connection resistance using a micro-ohmmeter. In addition to thermography or resistance measurement, accessible bolted connections not covered with heat shrink tape or boots are visually inspected for increased resistance of connection (e.g., loose or corroded bolted connections and hardware including cracked or split washers). The sample will be of 20% of the accessible metal enclosed bus bolted connection population with a maximum sample size of 25.

As an alternative to thermography or measuring connection resistance of bolted connections, for accessible bolted connections covered with heat shrink tape, sleeving, insulating boots, etc., insulating material may be visually inspected to detect surface anomalies, such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination. When an alternative visual inspection is used to check accessible metal enclosed bus bolted connections, the first inspection will be completed prior to the SPEO and every five years thereafter.

The inspections and resistance measurements will be performed prior to the SPEO and at least once every ten years during the SPEO.

NUREG-2191 Consistency

The *Metal Enclosed Bus* AMP is a new program that, when implemented, will be consistent with NUREG-2191, Section XI.E4, *Metal Enclosed Bus*.

Exception to NUREG-2191

None

Enhancements

None

Operating Experience

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the *Metal Enclosed Bus* AMP will be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO.

1. In 2009, INPO Significant Event Report 5-09 was issued for a 6.9 kV non-segregated bus fault at another plant. The overheating was attributed to the combination of heating and bus bolt torque relaxation from repeated thermal cycles over time. This condition was not detected due to repeated deferrals of preventive maintenance over an eight year period that would have inspected the torque of the flexible link bolts.

   The review of this industry OE was entered into the corrective action program for evaluation of applicability to Oconee. Since Oconee had previous plant-specific experience with detensioning and overheating of bolted bus connections, Oconee was found to be up to date on performing scheduled inspections for flex link bolt tightness.

   OE example 1 demonstrates that inspections of metal enclosed bus components are being performed in accordance with industry guidelines and that those inspections are effective in identifying aging effects prior to loss of intended function. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and to monitor and trend the conditions.

2. In 2014, thermography performed during a loaded run on Keowee Unit 2 detected a hot spot on a generator isolated-phase bus duct grounding strap. Subsequent investigation of the hot spot revealed that the grounding strap had paint on the mating surfaces. The grounding strap mating surfaces were cleaned and re-torqued. A post maintenance loaded run was performed and thermography of the subject grounding strap indicated that operating temperatures had returned to normal levels compared to adjacent bus duct components.

   OE example 2 demonstrates that existing maintenance practice using thermography is an effective method in detecting and correcting hot spots on metal enclosed bus prior to loss of intended function. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality and to monitor and trend the conditions.

3. In 2019, INPO reported industry OE regarding an automatic reactor scram due to a ground on the isolated-phase bus duct at another nuclear station. The ground was caused by water entry through a deteriorated gasket resulting in a low resistance ground fault. The Oconee bus inspection procedure was reviewed for applicability to this industry OE and it was determined that while the procedure included gasket inspection for

deterioration, procedure revision was needed to ensure that all access covers are checked for degraded gaskets.

OE example 3 provides objective evidence that industry OE that involves aging is evaluated and used to adjust the program as necessary.

The above examples of OE provide objective evidence that the aging management activities and methods to be implemented by the *Metal Enclosed Bus* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *Metal Enclosed Bus* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Metal Enclosed Bus* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.42 FUSE HOLDERS

Program Description

The *Fuse Holders* AMP is a new condition monitoring program. The program will apply to fuse holders outside of active devices susceptible to the following aging effects: increased resistance of connection due to chemical contamination, corrosion, and oxidation or fatigue caused by ohmic heating, thermal cycling, electrical transients, frequent removal and replacement, or vibration. It will also manage degradation of electrical insulation for the fuse holders with metallic clamps susceptible to the aging effects identified. Fuse holders inside an active device (e.g. switchgears, power supplies, inverters, battery chargers, and circuit boards) and not subject to the aging effects identified, are not within the scope of this program.

The metallic portion of fuse holders outside of active devices will be tested at least once every 10 years to assess the impact of any aging stressors. The specific type of test is determined prior to the initial test and detects increased resistance of fuse holder metallic clamp connections. Tests may include thermography, contact resistance testing, or other appropriately justified testing. The condition of the electrical insulation portion of the fuse holders outside of active devices will be visually inspected at least once every 10 years to provide an indication of the condition of the electrical insulation.

NUREG-2191 Consistency

The *Fuse Holders* AMP is a new program that, when implemented, will be consistent with NUREG-2191, Section XI.E5, Fuse Holders.

Exception to NUREG-2191

None

Enhancements

None

Operating Experience

Based on a search of pertinent Oconee OE, the following examples provide objective evidence that the *Fuse Holders* AMP will be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO.

1. In 2015, during a transformer phase rotation test, a loose fuse holder was discovered by observation of an electric arc between the fuse and fuse holder. The condition was entered into the corrective action program, the fuse holder was repaired and an investigation into possible causes was performed. The investigation determined this was a reoccurring issue. The installation procedures for this type of fuse contain notes regarding the orientation of the fuse during installation. Incorrect orientation during

installation was stated to be a cause for damaging the fuse clips. To prevent damage to additional fuse holders, a note in the installation procedure was changed to a caution statement to place more emphasis on the orientation of the fuse during installation. All applicable procedures were reviewed and updated. This example provides objective evidence that current maintenance practices are effective in identifying and correcting fuse holder deficiencies.

2. In 2015, while removing a fuse to perform testing associated with a MOV, the fuse holder tang fell off and the fuse holder was replaced. This example provides objective evidence that current maintenance practices are effective in identifying and correcting fuse holder deficiencies.

3. In 2016, during post-maintenance restoration of Keowee transformer CX, loose fuse holders were discovered in a 600 volt load center compartment. The fuse holder tension was adjusted to ensure good electrical contact and the other fuse holders in the compartment were checked.

   Although this equipment is not in the scope of SLR, OE example 3 provides objective evidence that existing maintenance practices, detection methods and the corrective action program effectively identify and correct deficiencies with the metallic portions of fuse holders prior to the loss of intended function.

The above three examples provide objective evidence that the aging management activities and methods being implemented by the *Fuse Holders* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

<u>Conclusion</u>

The implementation of the *Fuse Holder*s AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B2.1.43 ELECTRICAL CABLE CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

Program Description

The *Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is a new condition monitoring program that will manage the aging effects of increased electrical resistance of electrical cable connections (metallic parts).

This program will perform a one-time test, on a representative sampling basis, to confirm the absence of loosening of connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion and oxidation. Sample selection will be based on voltage level (medium and low-voltage), circuit loading (high current load), connection type, and location (high temperature, high humidity, vibration, etc.).

Non-EQ electrical cable connections (metallic parts) associated with cables within the scope of the program will be tested prior to the SPEO to assess the integrity of the cable connections. The specific type of test to be performed will be determined based on the type of connection and will be a proven method for detecting loose connections, such as thermography, contact resistance testing, or other appropriate testing methods without removing the connection insulation such as heat shrink tape, sleeving, insulating boots, etc.

Twenty percent of each connector type with a maximum sample size of 25 constitutes a representative connector sample size. Otherwise, a technical justification of the methodology and sample size used for selecting components under test will be included as part of the program documentation.

A representative sample of cable connections within the scope of SLR will be tested on a one time test basis or at least once every five years if only visual inspection is used to provide an indication of the integrity of the cable connections. Depending on the one time test results, subsequent testing may have to be performed within ten years of initial testing. The first visual inspections or tests for SLR are to be completed prior to the SPEO.

As an alternative to testing for accessible cable connections that are covered with heat shrink tape, sleeving, insulating boots, etc., a visual inspection of insulation materials to detect surface anomalies, such as embrittlement, cracking, chipping, melting, discoloration, swelling or surface contamination may be performed. When the alternative visual inspection is used to check cable connections, the first inspection will be completed prior to the SPEO and repeated at least every five years, thereafter. The basis for performing only the alternative visual inspection to monitor age-related degradation of cable connections will be documented.

NUREG-2191 Consistency

The ONS *Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP is a new program that, when implemented, will be consistent with NUREG-2191, Section XI.E6, *Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements*.

Exception to NUREG-2191

None

Enhancements

None

Operating Experience

Based on a search of pertinent ONS OE, the following examples provide objective evidence that the *Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be effective in managing aging effects for systems and components within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO.

1. In 2011, during routine thermography a main step-up transformer cooling fan cable connection was observed to have elevated temperature and the condition documented in the corrective action program. Periodic temperature monitoring was performed until the cooling fan could be taken out of service and a connection tightened. Post-maintenance thermography confirmed that the connection temperature had returned to normal and no additional actions were required.

   OE example 1 provides objective evidence that current maintenance thermography practices and the corrective action program effectively identify and correct cable connection issues prior to loss of intended function.

2. In 2013, a valve was found to have a boron leak and the leak was documented in the corrective action program. Leak targets identified included electrical cable connectors. The leak was repaired and boron cleaned from the valve components.

   OE example 2 demonstrates that visual inspections are effective in detecting the absence or presence of aging effects for electrical cable connections prior to the loss of an intended function.

3. In 2013, an action request was initiated in the corrective action program to document various alarms were received due to erratic nuclear instrumentation indication. Troubleshooting and electrical testing revealed that a cable connector associated with the reactor protection system was dirty. The connector was cleaned and indications returned to normal. During inspection and repair, the cable termination O-ring was not found installed as shown on the cable termination drawing and a condition report was initiated in the corrective action program. Subsequent engineering evaluation and review of the cable termination drawing determined that the O-ring was optional for the application. The drawing was updated to clarify cable termination sealing requirements.

   OE example 3 provides objective evidence that maintenance practices effectively maintain the condition of electrical cable connections to assure that these components will be able to continue to perform their intended functions during the SPEO. This example also demonstrates the effective use of the corrective action program to confirm and maintain configuration control between in-service equipment and design documentation.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, re-evaluation, repairs, or replacements will be provided for locations where aging effects are found. Periodic assessments of the *Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will be performed to identify the areas that need improvement to maintain effective performance of the program. The program will be informed and enhanced, when necessary, through the systematic and ongoing review of both plant specific and industry OE.

Conclusion

The implementation of the *Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B3.0 TIME-LIMITED AGING MANAGEMENT PROGRAMS

B3.1 Fatigue Monitoring

Program Description

The F*atigue Monitoring* AMP is an existing preventative program that manages fatigue or other types of cyclic loading time limited aging analyses (TLAAs) of the reactor pressure vessel components, reactor coolant pressure boundary piping components, and other components per the acceptance criterion in 10 CFR 54.21(c)(1)(iii). The program monitors and tracks the number of occurrences and severity of design basis transients assessed in the applicable fatigue or cyclic loading analyses, including those in applicable cumulative usage factor (CUF) analyses, environmentally-assisted cumulative usage fatigue (CUF_{en}) analyses, ASME Section III fatigue waiver analyses, and cycle-based flaw growth, flaw tolerance, or fracture mechanics analyses.

The *Fatigue Monitoring* AMP monitors and tracks the number of critical thermal, pressure, and seismic transients to ensure the cumulative usage factor (CUF) and environmentally-assisted fatigue (CUF_{en}) for each analyzed component does not exceed the applicable limit through the SPEO. The program monitors and tracks the number and severity of thermal and pressure transients for Oconee Units 1, 2, and 3 as specified in UFSAR Tables 5-2 and 5-23, which is mentioned in UFSAR Section 5.2.1.4 that is referenced in Technical Specification Section 5.5.6. For fatigue waiver analyses, the program follows the exemption rules outlined in ASME Section III, NB-3630 which uses enveloping design and normal service temperature and pressure values. These analyses only utilize Level A & B (Normal and Upset) cycles. For Oconee, piping systems designed per USAS B31.7 Class II and Class III and USAS B31.1 are to assume a stress range reduction factor to provide conservatism in the piping design to account for thermal fatigue due to cyclic operations. These analyses are not dispositioned in accordance with 10 CFR 54.21(c)(1)(iii), as shown in Section 4.3.3, and are not monitored by this program. The program will continue to monitor transient cycles to ensure that LBB analyses remain valid. No HELB analyses exclude break locations based on fatigue, therefore the program does not apply to HELB.

Design Basis Management

The program verifies the continued acceptability of existing design analyses through cycle counting. The program records, monitors, and tracks the overall cumulative number of plant transients. The program assures that the number of occurrences of each critical transient remains within the limits of the fatigue analyses, which in turn ensures that the analyses remain valid. Oconee UFSAR Table 5-2 and Table 5-23 provide a listing of design transients and associated design cycles. The program monitors actual operating conditions to ensure that fatigue analyses remain valid for the SPEO. The program requires that when a cumulative usage factor or environmentally-assisted cumulative usage fatigue value exceeds 80 percent of the applicable allowable limit or if the minimum time for any transient event total occurrence projection to reach the allowable is less than three years, then the issue shall be entered into the corrective action program.

Environmentally-Assisted Fatigue

Environmentally-adjusted cumulative usage factors are the design cumulative usage factors adjusted to account for the effects of the reactor water environment on component fatigue life. For a plant, the effects of reactor water environment on fatigue are evaluated by assessing a set of sample critical components for the plant. Examples of critical components are identified in NUREG/CR-6260, "*Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components;*" however, plant-specific component locations in the reactor coolant pressure boundary may be more limiting than those considered in NUREG/CR-6260, and thus should also be considered. Environmental effects on fatigue for these critical components may be evaluated using the guidance in RG 1.207, Revision 1, *"Guidelines for Evaluating the Effects of Light Water Reactor Coolant Environments in Fatigue Analyses of Metal Components;"* alternatively, the bases in NUREG/CR-6909, *"Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials,"* (with "average temperature" used consistent with the clarification that was added to NUREG/CR-6909, Revision 1); or other subsequent NRC endorsed alternatives.

The *Fatigue Monitoring* program relies on the *Water Chemistry* (B2.1.2) program to provide monitoring of appropriate environmental parameters for calculating environmental fatigue multipliers (F_{en} values).

The *Fatigue Monitoring* program monitors and tracks the number of occurrences of each of the critical thermal and pressure transients for the established sentinel locations in order to maintain the environmentally-assisted cumulative usage factor below 1.0. For the majority of the sentinel locations, the program documents the severity of operational parameters.

For the pressurizer surge line and high pressure injection system piping subject to environmentally assisted fatigue, the program manages the effects of aging due to fatigue through the *ASME Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD* program by conducting inspections in accordance with ASME Code, Section XI, Non-mandatory Appendix L.

Establish Inspection Frequency by Analysis: Flaw Tolerance

A special aspect of the *Fatigue Monitoring* AMP is the use of flaw tolerance analysis to establish specific inspection frequencies that may be greater than the ASME Section XI requirements. In some cases, flaw tolerance evaluations are used to establish inspection frequencies for components that, for example, exceed cumulative usage factors or environmentally-assisted cumulative usage fatigue limits. As an example, ASME Code, Section XI, Non-mandatory Appendix L provides guidance on the performance of fatigue flaw tolerance evaluations to determine acceptability for continued service of reactor coolant system branch line piping subjected to cyclic loadings. In flaw tolerance evaluations, the predicted size of a postulated fatigue flaw, whose initial size is typically based on the resolution of the inspection method, is a computed parameter that is used to determine the appropriate inspection frequency. The program monitors and tracks the number of occurrences of fatigue sensitive thermal and pressure transients for the selected components that are used in the fatigue flaw tolerance evaluations to verify that the inspection frequencies remain appropriate.

NUREG-2191 Consistency

The Oconee *Fatigue Monitoring* AMP is an existing program that will be consistent with the ten elements of Section X.M1 of NUREG-2191 with the enhancements described below.

Exception to NUREG-2191

None

Enhancements

The following enhancements will be implemented in the following program elements: Scope of Program (Element 1), Parameters Monitored/Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), Acceptance Criteria (Element 6), and Corrective Actions (Element 7)

1. The program will be enhanced to require monitoring and tracking of transient cycles associated with the ASME Code, Section XI, Appendix L analysis be performed between the inspections for each ASME Code, Section XI, Appendix L locations. Consistent with existing program cycle counting, a surveillance limit will be established to initiate corrective action prior to exceeding transient cycle assumptions in the ASME Code, Section XI, Appendix L analysis. (Elements 1, 3, 4, 5, 6, and 7)

2. The program will be enhanced to require periodic validation of chemistry parameters used to determine F_{en} factors used. (Elements 3, 4, 5, 6, and 7)

3. The program will be enhanced to expand existing corrective action guidance associated with exceeding a cycle counting surveillance limit to recommend consideration of component repair, component replacement, performance of a more rigorous analysis, performance of an ASME Code, Section XI, Appendix L flaw tolerance analysis, or scope expansion to consider other locations with the highest expected CUF_{en} values. (Element 7)

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Fatigue Monitoring* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In 2008, a corrective action entry was initiated to evaluate OE contained in NRC issued RIS 2008-30, *Fatigue Analysis of Nuclear Power Plant Components*. This resulted in action items being created for nuclear generation facilities to document the results of implementation of RIS 2008-30.

For Oconee, two different action items were written. The first action item completed addressed recording the implementation of NRC issued RIS 2008-30 as a LR commitment. This was dispositioned by documenting this issue in the associated program specific guide. The second action item completed was written to track the documentation of the RIS. The conclusion of this assignment was to review the calculations performed for LR to address the potential for increased thermal fatigue effects associated with reactor water, or “GSI-190” concerns. In particular, the review included a review to ensure that all aspects of RIS 2008-30 were addressed.

Additional actions included a vendor review of the supporting GSI-190 environmentally assisted fatigue calculations to confirm that the methods used for these environmentally assisted fatigue analyses appropriately considered a full six component tensor, as discussed in RIS 2008-30.

The conclusion of the review showed that the full six tensor approach or specific ASME Code equations were used for all of the environmentally-assisted fatigue analyses. The program documentation was updated to include the requirements of GSI-190. This OE shows that the program effectively considers regulatory guidance.

2. In 2010, a corrective action program entry was initiated by engineering to document and track actions required to update the *Thermal Fatigue Management* program based on modifications to the Oconee Unit 1 pressurizer seal weld. In 2010, the *Thermal Fatigue Management* program supporting documentation for the most recent allowed cycles for the Oconee Unit 1 pressurizer heater bundle seal Weld required updating. AREVA provided the updated fatigue analysis of the Oconee Unit 1 pressurizer heater bundle seal weld. The Oconee Unit 1 pressurizer heater bundle seal weld fatigue analysis was updated to add sufficient margin to the operating cycles. This pressurizer heater bundle seal weld developed a leak in 1989 that was repaired at that time. Supporting analysis for this repair concluded that a revised number of heatup and cooldown cycles (from initial plant operation) would be allowed for continued operation of this component.

   As Oconee Unit 1 has operated since then, the unit has continued to accumulate heatup and cooldown cycles. In 2009, Oconee asked the nuclear steam supply system vendor to update and refine the original analysis to support additional allowed cycles to increase the Oconee Unit 1 cycle margin. This latest nuclear steam supply system vendor fatigue analysis results in a higher number of allowed heatup and cooldown cycles. This additional margin was sufficient for Oconee Unit 1 operation until the pressurizer heater bundles were replaced in the fall of 2014. This new set of allowed cycles is currently documented in the Duke Energy document management system and is reflected in the *Thermal Fatigue Management* program basis.

   This resulted in a corrective action to update the program documentation to include the revised heatup and cooldowns for the Oconee Unit 1 pressurizer heater bundle seal weld.

   OE example 2 provides objective evidence that the *Thermal Fatigue Management* program is being effectively implemented to monitor components for fatigue usage during the first PEO, and continued implementation of the *Fatigue Monitoring* AMP will assure that the monitored components will continue to perform their intended functions during the SPEO.

3. In 2011, a corrective action was initiated to request engineering evaluation of possible thermal cycling effects on the Oconee Unit 2 high pressure injection system thermal sleeves from an October 2011 letdown flow reduction event. The data for the Oconee Unit 2 letdown flow reduction event was reviewed. The reduction of letdown flow resulted in a reduction of HPI normal make up flow for around 9 hours. When letdown was restored, normal make up flow recovered as expected.

   Since the normal make up flow did not go below the threshold and there was no additional significant cycling of the normal make up flow for this event, no significant thermal sleeve thermal cycling occurred. This event did not produce an excessive number of flow cycles nor a significant thermal cycle for the thermal sleeves. This high pressure injection flow event was logged during the monthly high pressure injection flow cycling data review at the end of the month and entered into the high pressure injection thermal sleeve cycling table for Oconee Unit 2.

   According to plant procedures, if letdown flow is less than 75 gpm with reactor coolant system temperature greater than 250°F, then a corrective action should be initiated to evaluate possible thermal cycling effects of high pressure injection thermal sleeves. This was completed and it was determined that no further evaluation was needed.

   OE example 3 provides objective evidence that the *Thermal Fatigue Management* program implementing procedures, along with the corrective action program, will effectively monitor in scope SSCs to assure that these components continue to perform their intended functions, and that appropriate aging management will be performed during the SPEO.

4. In 2011, a corrective action was initiated due to the allowable operating transient cycle manual cycle counting update not being performed in a timely manner. This issue was identified during a License Renewal IP-71003 readiness review. For the manual cycle counting, the plant computer data is reviewed and the individual transient events that each of the Oconee Units has experienced since the last counting period are identified. This information is logged, and a summary of the information is utilized to update the AOTC program documentation.

   This corrective action documented that the manual cycle counting summary reviews were not being completed on the specified due date. This was a documentation issue only, but did require attention, since it impacts the completeness of the overall cycle counting effort within the Oconee *Thermal Fatigue Management* AMP. The allowable operating transient cycle update was completed and the action item was closed.

   OE example 4 demonstrates that the *Thermal Fatigue Management* AMP calculations are tracked and effectively updated, as required, by the program. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality.

5. In 2013, a corrective action was initiated to document an error in the valve closure design load cycles used for the replacement once through steam generators. During the evaluation of the reactor building main steam penetrations, concerns arose about the design loads and the design cycles used in the analysis. A review of the replacement once through steam generators design calculations was performed to provide a comparison of the design loads and cycles for the main steam penetrations. The replacement once through steam generators review showed that one of the event cycles was evaluated correctly, but another was not. This corrective action documented the discrepancy and referenced the replacement once through steam generators supplier corrective action that was used to address the concern.

   A review of the supporting replacement once through steam generators analysis calculations shows that the stresses associated with the valve closure were included in the analysis and the resultant stresses met all code limits. This conclusion was confirmed with the replacement once through steam generator supplier. In addition, the fatigue contribution for the load set pairs from the valve closure loadings were so small that even if increased by a factor of ten, would still result in a total cumulative usage factor less than the Code allowable value.

   Therefore, the added cycles do not have a significant impact on the replacement once through steam generators design analysis results and are of concern only in they have not been formally included into the replacement once through steam generator design documentation. The design load set combinations were summarized and have been sent to Oconee for the main steam penetrations.

   OE example 5 provides objective evidence that the *Thermal Fatigue Management* program documentation is reviewed and evaluated to ensure that it remains valid. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality.

6. In 2014, a corrective action program entry was initiated to evaluate industry OE of rejectable weld indications identified on the cold leg injection lines at a pressurized water reactor facility. The evaluation would determine if additional non-destructive examination inspections should be performed in the upcoming Unit 2 and Unit 1 outages. The industry OE report was reviewed, which documented that the cause of the cracks was high cycle thermal fatigue, most likely produced by turbulent penetration of hot reactor coolant cold leg fluid into stagnant injection lines and mixing with cooler water.

   The flaws were identified with the same non-destructive examination method as used at Oconee at the time for all the high pressure injection nozzles that are subject to these phenomena. There was nothing documented in the industry OE report that would result in any additional corrective actions that haven’t already been implemented due to plant-specific OE. The industry OE report supported the conclusion that additional examinations for Oconee Unit 2 during the forced outage, or the during the Oconee Unit 1 refueling outage in the fall of 2014 were not warranted. No additional corrective actions were required.

OE example 6 provides objective evidence that industry OE that involves aging is evaluated and used to adjust the program as necessary. This example also demonstrates that the corrective action program is used effectively to identify and evaluate conditions adverse to quality.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Fatigue Monitoring* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Fatigue Monitoring* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Fatigue Monitoring* AMP, with the noted enhancements, will provide reasonable assurance that the aging effects are adequately managed so that the intended functions of components within the scope of LR are maintained consistent with the CLB during the SPEO.

B3.2 Neutron Fluence Monitoring

Program Description

The *Neutron Fluence Monitoring* AMP is an existing condition monitoring program that manages loss of fracture toughness due to neutron fluence of the reactor pressure vessel regions for which neutron fluence is projected to exceed 1.0E+17 n/cm^2 (E>1MeV) during the SPEO to ensure continued validity of neutron fluence analyses and that applicable reactor pressure vessel neutron irradiation embrittlement analysis (i.e., TLAAs) will remain within their applicable limits. Neutron fluence is a time-dependent input parameter for evaluating reduction of fracture toughness due to neutron irradiation embrittlement. This program monitors the reactor pressure vessel and reactor vessel internals neutron fluence to verify the continued acceptability of existing irradiation embrittlement and related analyses during the SPEO. The components evaluated by these analyses are the reactor pressure vessel shell and welds and reactor vessel internal components subject to reactor coolant and neutron flux environment which are fabricated from carbon or low alloy steel with stainless steel cladding, stainless steel, and nickel alloy materials.

The program has two aspects, one to verify the continued acceptability of existing analyses through neutron fluence monitoring, and the other to provide periodically updated evaluations of the analyses involving neutron fluence inputs to demonstrate that they continue to meet the appropriate limits defined in the CLB.

This program is used in conjunction with the Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report AMP XI.M31, “Reactor Vessel Material Surveillance” (Reference: SLR-ONS-AMPR-XI.M31). Accurate neutron fluence values are also necessary to identify the reactor pressure vessel beltline region, for which neutron fluence is projected to exceed 1.0E+17 n/cm^2 (E > 1 MeV) during the subsequent period of extended operation.

Monitoring is performed to verify the adequacy of neutron fluence projection methods that are defined for the CLB in NRC approved reports. Cavity dosimetry measurements are used to verify the accuracy of fluence calculations and to determine fluence uncertainty values in accordance with NRC Regulatory Guide 1.190, *“Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence.”* These calculations, and related uncertainties, determine when the neutron fluence is projected to exceed 1.0E+17 n/cm^2 (E > 1 MeV) for specific reactor vessel items during the subsequent period of extended operation and thus, require monitoring to ensure their embrittlement analyses remain below applicable limits.

For neutron fluence monitoring activities that apply to components located in the beltline region of the reactor pressure vessels, the monitoring methods are performed in a manner consistent with the monitoring methodology guidelines in RG 1.190, *“Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence.”* Neutron fluence monitoring methods that are applied to reactor pressure vessel locations outside of the beltline region of the reactor pressure vessels are justified and are consistent with NRC approved methodology. These methods have been benchmarked with both in-vessel and ex-vessel cavity dosimetry for the beltline region.

Neutron Fluence Monitoring AMP results are compared to the neutron fluence parameter inputs used in the neutron embrittlement analyses for reactor pressure vessel components that are required by specific regulations in 10 CFR Part 50. The neutron irradiation embrittlement TLAAs that are within the scope of this Oconee AMP include, but are not limited to: (a) neutron fluence, (b) pressurized thermal shock analyses for pressurized water reactors, as required by 10 CFR 50.61 or alternatively [if applicable for the current licensing basis (CLB)] by 10 CFR 50.61a; (c) reactor pressure vessel upper-shelf energy analyses, as required by Section IV.A.1 of 10 CFR Part 50, Appendix G, and (d) pressure-temperature limit analyses that are required by Section IV.A.2 of 10 CFR Part 50, Appendix G and controlled by plant technical specifications (TS) update and reporting requirements i.e., the 10 CFR 50.90 license amendment process for updates of pressure-temperature limit curves located in the TS limiting conditions of operation, or TS administrative control section requirements for updates of pressure-temperature limit curves that have been relocated into a pressure-temperature limits report.

Reactor vessel surveillance capsule dosimetry data obtained in accordance with 10 CFR Part 50, Appendix H requirements and through implementation of the *Reactor Vessel Material Surveillance* AMP (Reference A2.19) provides inputs to and have impacts on the neutron fluence monitoring results that are tracked by this program. In addition, regulatory requirements in the plant technical specifications or in specific regulations of 10 CFR Part 50 apply, including those in 10 CFR Part 50, Appendix G; 10 CFR 50.55a; and the PTS requirements in 10 CFR 50.61, as applicable for the CLB.

Verification of the uncertainty in assumed reactor vessel fluence values is performed on a cycle-by-cycle basis to ensure neutron fluence projections remain bounding with respect to actual plant operating conditions. The verification is accomplished by performing a review of key reactor vessel fluence input parameters to ensure that any significant changes would be evaluated.

The Oconee calculations of neutron fluence also factor into other analyses or technical report methodologies that assess irradiation-related aging effects. Examples include, but are not limited to: (a) determination of the reactor pressure vessel beltline as defined in Regulatory Issue Summary 2014-11, *"Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components,"* (b) evaluation of the susceptibility of reactor vessel internals components to neutron radiation damage mechanisms, including irradiation embrittlement, irradiation-assisted stress corrosion cracking, irradiation-enhanced stress relaxation or irradiation creep and void swelling or neutron induced component distortion; and (c) evaluating the dosimetry data obtained from an reactor pressure vessel surveillance program.

The Oconee program methods and assumptions for determining reactor pressure vessel neutron fluence for the beltline region are consistent with NRC Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence." These methods have been benchmarked with both in-vessel and ex-vessel cavity dosimetry for the beltline region as reported in BAW-2241P-A, Revision 2.

While no additional in-vessel dosimetry is planned, ONS utilizes ex-vessel (cavity) dosimetry for Unit 2 as a continuous fluence monitoring device. Cavity dosimetry measurements provide continued experimental data to verify the accuracy of fluence calculations and to determine fluence uncertainty values.

Plant-specific fluence analyses were performed for the reactor pressure vessel and reactor vessel internals to support the Oconee SLRA. These plant-specific fluence analyses followed Framatome's NRC approved methodology described in BAW-2241P-A, Revision 2, "Fluence and Uncertainty Methodologies." Although this methodology has not been approved for use outside of the traditional beltline, it was shown in ANP-10348, "Fluence Methodologies for SLR" that Framatome's discrete ordinates methodology is conservative in the nozzle (extended beltline) region. This is due to the conservative modeling of the upper internals, which are modeled as "hot water" and the conservative modeling of the reactor cavity, where all structural components are neglected.

For reactor vessel internals, the Electric Power Research Institute Materials Reliability Program (MRP) conducted an expert panel to evaluate the neutron fluence impacts on the susceptibility of reactor vessel internals items to neutron radiation damage mechanisms (including irradiation embrittlement, irradiated-assisted stress corrosion cracking, irradiation-enhanced stress relaxation or creep and void swelling or neutron induced component distortion), during the development of reactor vessel internals aging management guidance. A gap analysis based on MRP-227, Revision 1-A, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines," identified enhancements to the reactor vessel internals inspection recommendations for the subsequent period of extended operation. In support of the gap analysis, detailed deterministic (discrete ordinate transport 2-D) and Monte Carlo ONS reactor vessel internals calculations were performed to justify that MRP-189, Revision 3 is applicable to ONS during the subsequent period of extended operation, and to justify that 72 EFPY neutron exposure used to update the reactor vessel internals TLAA reported in BAW-10008 for the SPEO is in compliance with NUREG-2191, X.M2. The reactor vessel internals will be monitored along with the reactor pressure vessel as part of the *Neutron Fluence Monitoring* AMP.

Ex-vessel cavity dosimetry is used to monitor neutron fluence because the Oconee units do not currently have in-vessel surveillance capsules. Only the ONS Unit 2 reactor vessel has installed cavity dosimetry. However, the ONS Unit 1 and ONS Unit 3 reactor vessel fluence uncertainty values are based on Oconee Unit 2 cavity dosimetry results due to similar design, fabrication, operation, and fuel loading patterns.

The use of the ONS Unit 2 cavity dosimetry for Oconee Unit 1 and Oconee Unit 3 was approved by the NRC in a letter to Duke Power Company dated December 5, 1988 [Reference D. B. Matthews (NRC) letter dated December 5, 1988 to H.B.Tucker (Duke), Subject: "Cavity Dosimetry Program", Oconee Nuclear Station Units 1, 2, and 3 (TAC 65759, 65760, 65761), Docket Nos. 50-269, 50-270, 50-287].

Oconee utilizes cavity dosimetry as a continuous fluence monitoring device for the reactor pressure vessel beltline region. Cavity dosimetry measurements are used to verify the accuracy of reactor pressure vessel fluence calculations and to determine fluence uncertainty values. These calculations and related uncertainties determine when the neutron fluence is projected to exceed 1.0E+17 n/cm^2 (E > 1 MeV) for specific reactor vessel items during the subsequent period of extended operation and thus, require monitoring to ensure their embrittlement analyses remain below applicable limits.

Through the program, cavity dosimetry measurements are used to verify the accuracy of fluence calculations and to determine fluence uncertainty values in accordance with Regulatory Guide 1.190. This program will continue during the period of subsequent license renewal as part of the AMP for reactor pressure vessel and reactor vessel internals neutron embrittlement.

NUREG-2191 Consistency

The *Neutron Fluence Monitoring* AMP is an existing program that is consistent with NUREG-2191, Chapter X.M2, *Neutron Fluence Monitoring*, as modified by SLR-ISG-MECHANICAL-2021-02, *Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance* (ADAMS Accession Number ML20181A434).

Exception to NUREG-2191

None

Enhancements

None

Operating Experience

Based on a broad search of pertinent Oconee operating experience, the following examples provide objective evidence that the *Neutron Fluence Monitoring* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the subsequent period of extended operation. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. ONS has utilized cavity dosimetry to support neutron fluence monitoring since the 1980s. Since all three units have a similar design, fabrication, operation, and fuel loading patterns, only the ONS Unit 2 reactor vessel has installed cavity dosimetry to support neutron fluence monitoring. The use of the ONS Unit 2 cavity dosimetry for Unit 1 and Unit 3 was approved by the NRC in a letter to Duke Power Company dated December 5, 1988. Cavity dosimetry has been irradiated at ONS Unit 2 since cycle 9. The cavity dosimeters are measured to determine the activity resulting from the fast fluence irradiation. In addition, calculations of the dosimetry activities are performed using operational data. The calculation activities are compared to the measurement activities to verify the accuracy and the uncertainty in the calculated fluence. The cavity dosimeters are measured within a frequency such that the fluence uncertainty is kept within the guidance of Regulatory Guide 1.190.

   Dosimetry was last removed during the Oconee Unit 2, cycle 28 outage (November 2017). A reactor vessel fluence analysis was performed in accordance with the requirements of RG 1.190, and the fluences reconciled to account for changes associated with the Oconee measurement uncertainty recapture power uprate license amendment request (ADAMS Accession Number ML20050D379 and ML20335A001).

OE example 1 provides objective evidence that the existing AMP activities are being effectively implemented to identify and manage aging effects of in-scope components, and that the results of these activities are used to inform and enhance the program.

2. In 2011 and 2012, action items were initiated in the corrective action program that identified improvements in the fluence projection process required to meet ONS license renewal reactor vessel integrity program commitments. The action consisted of revising a core design procedure to evaluate the impact of core design changes for their effect on reactor vessel fluence. The procedure was revised to include actions to evaluate changes in fuel cycle length, cycle operating history, and fuel assembly cross section. If fluence impacts due to core design changes are identified, the revised procedure requires entry into the corrective action program for determination of the necessary analyses and corrective actions.

   OE example 2 provides objective evidence that first license renewal program commitments have been properly implemented and that identified deficiencies are entered into the corrective action program. The corrective action program is effective in evaluating and correcting programmatic deficiencies.

3. In 2012, an action item was initiated in the corrective action program that identified actions needed to update reactor vessel integrity Time-Limited Aging Analyses (TLAAs) as a result of planned changes in the ONS fuel cycle, including (a) an increase in capacity factor, (b) Measurement Uncertainty Recapture, (c) implementation of 24-month fuel cycles, and (d) implementation of once-burned high thermal performance (HTP) fuel assemblies on the periphery. Additionally, the TLAAs were updated to account for replacing the ex-vessel dosimetry in Unit 2 (see OE example 4), and to incorporate updated fluence transport calculations to address the described changes. Actions to replace the ex-vessel dosimetry and update fluence calculations to the current end-of-life were completed in 2018.

   OE example 3 provides objective evidence that the program manager for the *Neutron Fluence Monitoring* AMP utilizes the corrective action program to self-identify changing plant conditions and to take timely corrective actions to assure that components will continue to perform their intended functions.

4. In 2016, an action item was initiated in the corrective action program to identify that the ONS existing ex-vessel dosimetry capability should be expanded to include the extended beltline region, which includes the nozzle region and the region below the active core. This work was facilitated through Duke Energy’s participation in the Pressurized Water Reactor Owners Group. Measurement data from the ex-vessel dosimetry program provides the basis for justification of neutron fluence. The work also addresses the NRC RG 1.190 requirement that licensees are required to benchmark their fluence calculational methodologies against measured data and addresses recent NRC concerns regarding the qualification basis for neutron fluence calculations outside of the traditional beltline region. This action to install ex-vessel dosimetry to monitor traditional and extended beltline regions in Unit 2 was completed in 2018.

OE example 4 provides objective evidence that the program manager for the *Neutron Fluence Monitoring* AMP critically self-assesses program performance and self-identifies actions that support continuous improvement and to assure that components will continue to perform their intended functions.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Neutron Fluence Monitoring* AMP will be effective in managing aging effects prior to loss of intended function for the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Neutron Fluence Monitoring* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience.

Conclusion

The implementation of the *Neutron Fluence Monitoring* AMP will provide reasonable assurance that reactor pressure vessel and reactor vessel internals neutron fluence input to applicable TLAA will be adequately managed so that the reactor vessel and reactor vessel internals intended functions will be maintained consistent with the current licensing basis during the SPEO.

B3.3 Environmental Qualification of Electric Equipment

Program Description

The *Environmental Qualification of Electric Equipment* AMP is an existing program that manages the aging of electrical equipment within the scope of 10 CFR 50.49, *Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants*. The program includes electric equipment composed of various polymeric and metallic materials that is important to safety. This electric equipment could be subject to the harsh environment effects of a LOCA, HELB, or post-LOCA environment. The electrical equipment could be subject to an adverse localized environment due to temperature or radiation. The program establishes, demonstrates, and documents the TLAA analysis, qualification level, qualified configurations, maintenance, surveillance and periodic replacements necessary to meet 10 CFR 50.49.

Equipment qualified life is specified for equipment within the program scope and appropriate actions such as replacement, refurbishment, or reanalysis are performed prior to the end of qualified life. Changes to material activation energy values as part of a reanalysis are justified. Activities to visually inspect accessible, passive EQ electric equipment located in adverse localized environments at least once every ten years will be added to the program prior to the SPEO.

If an EQ component is determined to be outside the bounds of its qualification basis or when an unexpected adverse localized environment or condition is identified during operational or maintenance activities, the qualification of the affected EQ equipment is evaluated in the corrective action program and appropriate corrective actions are taken to resolve the condition.

The various aging effects addressed by this program are adequately managed so that the intended functions of components within the scope of 10 CFR 50.49 are maintained consistent with the CLB during the SPEO.

NUREG-2191 Consistency

The *Environmental Qualification of Electric Equipment* AMP, after enhancement, will be consistent with the ten elements of AMP NUREG-2191, Section X.E1, *Environmental Qualification of Electric Equipment*.

Exception to NUREG-2191

None

Enhancements

The following enhancements will be implemented for the following program elements: Detection of Aging Affects (Element 4) and Acceptance Criteria (Element 6)

1. Add activities to perform visual inspections of accessible, passive EQ electric equipment located in adverse localized environments at least once every 10 years. The first periodic visual inspection will be performed prior to the SPEO. (Element 4)

2. Establish acceptance criteria for the visual inspection of accessible passive EQ electric equipment located in adverse localized environments. (Element 6)

<u>Operating Experience</u>

Based on a broad search of pertinent ONS OE, the following examples provide objective evidence that the *Environmental Qualification of Electric Equipment* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In 2011, cracked terminal block barriers on an electrical penetration were found while performing an inspection procedure. The purpose of the procedure was to inspect the material condition, clean the exterior and interior of the electrical penetration enclosures as necessary, and perform other corrective actions as identified during the inspection. The inspection procedure scope included terminal blocks and cables.

   The terminal block barrier provides electrical insulation between adjacent terminals. Based on an inspection, the portions of the barriers remaining in place were sufficient to perform the electrical insulation function. The damaged terminal blocks were replaced.

   OE example 1 provides objective evidence that visual inspections, along with the corrective action program, will effectively monitor in scope SSCs to assure that these components will continue to perform their intended functions, and that appropriate aging management will be performed during the SPEO.

2. In 2012 while performing an extent of condition as a result of a condition identified at another United States power reactor facility where motor operated valve actuator operating cycle limits were exceeded, it was discovered that an ONS containment isolation motor operated valve actuator had also exceeded the EQ program replacement interval of 2000 operating cycles. With no testing to support operation beyond 2000 cycles, the valve was declared inoperable, closed and administratively deactivated.

   Subsequent investigation and evaluations determined that due to lower than postulated thermal aging, accident temperatures, radiation exposure and mechanical stresses, there was reasonable assurance the valve would have performed its intended containment isolation function, notwithstanding exceeding the 2000 cycle limit.

   A cause analysis determined that the motor operated valve program had been using an informal spreadsheet and process to track operating cycles and predict and plan for actuator replacement before the 2000 cycle limit was reached. The cycle limit was a new design requirement for this valve type; however, the *Environmental Qualification Maintenance Manual* was never appropriately revised to reflect this limit.

Corrective actions included replacing the subject motor operated valve actuator, further extent of condition to determine if other actuators had exceeded or approaching the operating cycle limit, revising the *Environmental Qualification Maintenance Manual* to include the 2000 cycle limit and establishing an automated means of collecting motor operated valve actuator cycles.

OE example 2 objectively demonstrates the effective use of systematic and ongoing review of industry OE and the corrective action program to identify degraded conditions, perform extent of condition reviews, and take timely corrective action to ensure that intended functions are maintained during the SPEO.

3. In 2013, it was determined that due to routing of reactor coolant system chemical sample lines the analyzed radiation dose had increased both normal and accident radiation levels for limited areas inside the Unit 3 electrical equipment rooms. The postulated increased radiation resulted in these areas changing from a mild to a harsh environment as defined by the Oconee *Environmental Qualification Criteria Manual* and 10 CFR 50.49 for electrical equipment. An operability determination concluded that the affected electrical equipment, while not qualified for a harsh environment, was considered operable but required corrective actions.

   The corrective actions to resolve the concern included adding the electrical equipment to the EQ program, equipment replacement, and shielding. The option selected was to replace selected radiation sensitive electrical components at a frequency that would preclude exceeding their respective total integrated dose limits.

   OE example 3 provides objective evidence that plant modifications resulting in environmental changes affecting equipment aging are entered into the corrective action program. Appropriate corrective actions are implemented to evaluate and resolve the deficiencies using fleet EQ procedures and analytical methods.

4. In 2014, it was determined that the cable entrance sealing guidance in the solenoid valve *Environmental Qualification Maintenance Manual* required clarification. The *Environmental Qualification Maintenance Manual* cable sealing requirements state that outside containment solenoid valves do not require cable entrance sealing based on a previous operability evaluation. The operability evaluation took credit for the valve failure mode (fail close) while performing its event mitigation required function; however, this evaluation was only performed on a subset of outside containment solenoid valves.

   It was subsequently recognized that there were additional outside containment solenoid valves in the EQ program which were not previously evaluated for proper sealing with respect to event mitigation failure mode and a condition report was initiated in the corrective action program.

Corrective actions included an operability evaluation and extent of condition for the rest of the outside containment solenoid valves in the EQ program and revising the solenoid valve *Environmental Qualification Maintenance Manual*. The *Environmental Qualification Maintenance Manual* revision provided additional guidance on cable sealing requirements with respect to valve failure modes and position (energized/deenergized and fail open/fail close) for the event mitigation intended function.

OE example 4 demonstrates that the ONS EQ program is informed through the systematic and ongoing review of plant-specific OE and programmatic changes are made as necessary.

5. In 2017, a NRC component design basis inspection at another United States power reactor facility identified discrepancies between the plant-specific maintenance requirements for NAMCO EA-180 limit switches and the requirements established by the qualified equipment supplier EQ test report. The supplier documentation required whenever the switch is opened, inspections of the cover gaskets, o-rings, and other items must be performed in order to maintain the switch EQ.

   As a result, ONS performed a review to determine if similar EQ documentation discrepancies for NAMCO switches existed and it was found that ONS had the same issue. ONS actions resulting from this condition included an operability determination for the affected switches, revision of maintenance procedures and associated *Environmental Qualification Maintenance Manual* documentation to reflect vendor requirements when the switch is opened.

   OE example 5 demonstrates that the ONS EQ program is informed through the systematic and ongoing review of industry OE where evaluations are performed to improve the EQ program as necessary.

6. In 2016, a Duke General Office, Catawba, McGuire and Oconee EQ program focused self-assessment was performed in accordance with internal requirements for periodic EQ program reviews. An additional Oconee-specific EQ program 2018 self-assessment was performed as part of the readiness review for an NRC design basis assurance inspection of the Oconee EQ program.

   The objective of the 2016 and 2018 self-assessments was to compare the existing implementation of the Oconee EQ program with internal Duke EQ program procedures, 10 CFR 50.49 requirements, and NRC EQ program specific inspection procedures. The results of the 2016 and 2018 inspections identified various items for Oconee EQ program improvement that were entered into the corrective action program for resolution.

   This OE example provides objective evidence that the Oconee EQ program critically self-assesses program performance on a periodic basis and adjusts the EQ program as necessary to support continuous improvement. The corrective action program is appropriately used to identify, evaluate, and address conditions adverse to quality.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Environmental Qualification of Electric Equipment* AMP will be effective in managing aging effects prior to loss of intended function during the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for conditions where aging effects are found. Periodic assessments of the *Environmental Qualification of Electric Equipment* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Environmental Qualification of Electric Equipment* AMP, with the noted enhancements, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B3.4 Concrete Containment Unbonded Tendon Prestress

Program Description

The *Concrete Containment Unbonded Tendon Prestress* AMP is an existing program that is predicated on the ASME Section XI, Subsection IWL requirements. The program consists of an assessment of measured tendon prestress forces obtained during examinations currently performed in accordance with Subsection IWL of the ASME Code, Section XI, as incorporated by reference in 10 CFR 50.55a. This AMP includes confirmatory actions that monitor loss of containment tendon prestressing forces during the current term and will continue through the SPEO.

The program requires measurement of prestressing forces on an initial sample of each tendon group based on type (dome, hoop, vertical) and subgroups as a result of repair/replacement activities. The measurements are performed every five years, as specified in IWL-2400 and the alternate provision of IWL-2421. In addition to the random sampling used for tendon lift-off force measurement, one tendon in each group and subgroup is selected as a common tendon. The initial sample size, which may be expanded if unacceptable conditions are found such as prestressing force values less than 95% of the predicted lower limit value, is established as specified in Table IWL-2521-1.

Assessments of the results of the tendon prestressing force measurements are performed in accordance with *ASME Section XI, Subsection IWL* (B2.1.29) program to confirm adequacy of the prestressing forces. The assessment consists of a comparison of predicted lower limit values to corresponding minimum required prestressing values, and includes the development of trend lines. The acceptance criteria consist of predicted values on the forces in individual tendons and the corresponding tendon group minimum required prestressing values. The predicted lower limit value for individual tendons is developed based upon the original design criteria and CLB for the tendons. These criteria consider the same factors that are described in RG 1.35.1. The UFSAR, in Section 3.8.1.4, when describing the containment design, notes that any three adjacent tendons in any of these groups can be lost without significantly affecting the strength of the structure due to the load redistribution capabilities of the shell structure.

Trend lines, one for each tendon group, are developed using the measured tendon forces and represent the changes in mean vertical, hoop and dome prestressing forces with time. Trend line regression analysis is performed consistent with NRC Information Notice 99-10. The trend line for each tendon group and subgroup is constructed by regression analysis of all individual, measured prestressing forces in individual tendons of that group and subgroup obtained from all previous representative examinations. If the trend lines do not fall below the minimum required prestressing values prior to the next scheduled surveillance, the tendon prestress force is considered to be acceptable. In accordance with the requirements of 10 CFR 50.55a(b)(2)(viii)(B), an evaluation would be performed and reported in the engineering evaluation report as prescribed in IWL–3300, if the trend lines predict the prestressing forces in the containment to be below the minimum required prestressing value before the next scheduled inspection. The evaluation would include identification of corrective action, if required, prior to tendon forces falling below the minimum required prestressing value established in the design. Corrective actions may include retensioning of tendons, replacement of selected tendons with new tendons, or reanalysis of the concrete containment in order to restore the containment to the required level of structural integrity, prior to a loss of intended function.

The program requires measurement of prestressing forces on an initial sample of each tendon group based on type (dome, hoop, vertical) and subgroups that have resulted from previous Oconee tendon surveillance practice and repair/replacement activities. The measurements of the prestressing force at randomly selected tendons are performed every five years, as specified in IWL-2400. The measurements of the prestressing force at common tendons are performed on a nominal 5 year interval that considers the alternative provisions of IWL-2421. The initial sample size is established as specified in Table IWL-2521-1. The initial sample size may be expanded as the measured force values are compared to the acceptance criteria described in IWL-3221.1, if the measured forces are less than 95% of the predicted forces.

The original Oconee tendon surveillance requirements were established in the original plant Technical Specifications and Subsection IWL of the ASME Code, Section XI, as incorporated by reference in 10 CFR 50.55a. A fixed population of tendons were preselected, and the same tendons were inspected by lift-off testing for all surveillances. The surveillance program consisted of periodic inspections of nine predesignated tendons; three horizontal, three vertical, and three dome tendons on each unit. One of the three tendons in each group was detensioned and retensioned for wire sample removal on a rotational basis. As a result of repeated detensioning and retensioning, tendons were determined to be damaged to the extent that they no longer represent the tendon forces in the group as common tendons. A Technical Specification change was subsequently submitted and approved that requires 11 representative tendons (five hoop, three vertical, and three dome) to be selected randomly with one tendon in each group to be kept unchanged for the subsequent inspection. Original Oconee tendon prestressing force examination results are not included in the trend lines for the common group maintained by the *Containment Tendon Surveillance* program, except for the test results from the first year since the later results do not truly represent the tendon forces in the group as common tendons. Later results are not considered representative due to the wire removal and retensioning performed of the tendons.

Tendon prestressing force examination results for hoop and vertical tendons that were retensioned or replaced as part of the steam generator replacement project are not included in the trend lines for the hoop and vertical tendons maintained for the common group by the *Containment Tendon Surveillance* program. These tendons constitute a subgroup of hoop and vertical tendons due to the different maintenance history. There are too few examination results for these tendons to create a trend line for these subgroups and the measured tendon prestress values are significantly higher than the original tendons so that if included, the trend line would become unconservative. The examination results for these subgroups currently exceed the minimum required prestressing value and the predicted lower limit.

The plotted trend line results provide reliable, reasonable, and adequate data regarding the amount of tendon prestress force losses experienced during the early years of plant operation. The plotted data is adequate to define the recent trend in prestress tendon force losses to ensure that, for continuity of containment structural integrity, tendon prestress forces remain above the minimum required prestressing value during the SPEO.

NUREG-2191 Consistency

The Oconee *Concrete Containment Unbonded Tendon Prestress* AMP is an existing program that is consistent with the ten elements of AMP X.S1, *Concrete Containment Unbonded Tendon Prestress* specified in NUREG-2191 (GALL-SLR) with exceptions as described below.

Exception 1 to NUREG-2191

The following program element(s) have exceptions:

Program Element Affected: Parameters Monitored or Inspected (Element 3)

1. The initial common tendon prestress lift-off force data in the TLAA figures in Section 4.5 were obtained from the first year sampled tendons, which were then detensioned and retensioned, as well as subject to wire removals, which is not in accordance with IWL-2521(b) requirements for common tendons, and is considered to be an exception for this element

   Justification for Exception 1

   1. The original dome, horizontal, and vertical surveillance tendons were not random but were uniquely defined, and although re-tensioned during each surveillance subsequent to the first year surveillance, the plotted results can still provide reliable, reasonable, and adequate data on the amount of losses experienced during the early years of plant operation.

   2. The initial program, although different from that required by *ASME Section XI, Subsection IWL* (B2.1.29), provided a continuous monitoring of containment tendon prestress forces by targeting specific segments of the containment to ensure that, for continuity of containment structural integrity, tendon prestress forces remain above the minimum required prestressing during the SPEO.

   3. The dome, horizontal, and vertical historical tendon lift-off force datapoints in conjunction with those obtained from beyond 1997 are adequate to define the recent trend in prestress tendon forces losses.

   4. The average of the dome, horizontal, and vertical historical tendon lift-off force datapoints for each group for each examination exceed the minimum required prestressing with significant margin.

Exception 2 to NUREG-2191

Program Element Affected: Monitoring and Trending (Element 5)

2. All measured prestressing forces up to the current examination are not plotted against time. The original Oconee tendon prestressing force examination results are not included in the current trend lines, except for the test results from the first year since the results do

not truly represent the tendon forces in the group as common tendons and can result in misleading trend lines if included, due to the wire removal and retensioning of the tendons. In addition, the tendon prestressing force examination results for those hoop and vertical tendons that were retensioned or replaced as part of the steam generator replacement project are not included in the current trend lines. This is considered to be an exception for this element.

Justification for Exception 2

1. The original dome, horizontal, and vertical surveillance tendons were not random but were uniquely defined, and although re-tensioned during each surveillance subsequent to the first year surveillance, the plotted results can still provide reliable, reasonable, and adequate data on the amount of losses experienced during the early years of plant operation.

2. The initial program, although different from that required by *ASME Section XI, Subsection IWL* (B2.1.29), provided a continuous monitoring of containment tendon prestress forces by targeting specific segments of the containment to ensure that, for continuity of containment structural integrity, tendon prestress forces remain above the minimum required prestressing during the SPEO.

3. The dome, horizontal, and vertical historical tendon lift-off force datapoints in conjunction with those obtained from beyond 1997 are adequate to define the recent trend in prestress tendon forces losses.

4. The average of the dome, horizontal, and vertical historical tendon lift-off force datapoints for each group and subgroup for each examination exceed the minimum required prestressing with significant margin.

5. The number of tendon examination results that are not included in the trend lines is small with respect to the total number of tendons as a result of the different maintenance histories for the original common tendons or those tendons affected by the steam generator replacement project. This limits the potential impact on the containment intended function to what be expected to be a small value.

Enhancements

None

Operating Experience

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Concrete Containment Unbonded Tendon Prestress* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the CLB for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In September 2020, an AMP effectiveness review was performed on the containment inservice inspection program. The containment inservice inspection program was evaluated against the performance criteria identified in NEI 14-12 "Aging Management Program Effectiveness." The review concluded that the containment inservice inspection program is meeting the requirements of NEI 14-12. No gaps were identified during the effectiveness review.

   In 2008, a self-assessment was completed by Duke Energy corporate engineering personnel to identify and evaluate risks to the integrity of post-tensioned containments across the fleet, and to identify programs used to monitor or prevent conditions that could lead to a failure of containment integrity. For those risks not managed effectively by one or more of these programs, this assessment developed recommendations that would help to better manage or reduce these risks. This assessment focused on the following site programs and sources of information: 1. ASME Code, Section XI Inservice Inspection Program (*Containment Inservice Inspection* Program); 2. *Boric Acid Corrosion* Program; 3. *10 CFR 50, Appendix J* Program; 4. *Coatings* Program; 5. OE data. Each of the programs are intended to either prevent unacceptable degradation or help to identify degradation before it has progressed to a state that threatens the leak-tight or structural integrity of the containment. The assessments were based upon a review of the Duke Energy fleet as well as industry OE, which included loss of tendon prestressing forces. It was concluded that these programs help to manage risks that can challenge containment integrity and that overall, these programs at Oconee are satisfying their established purposes. Risks that might result in containment tendon degradation were evaluated that result in an excessive, unexpected loss of tendon prestress, which has not been identified at Oconee. These risks fall within the scope of the *ASME Section XI, Subsection IWL* AMP and generally involve material condition issues or containment concrete temperatures not adequately addressed during original containment design and construction. No recommended improvements to the trending of the tendon prestress forces were identified as part of this assessment. In addition, degradation mechanisms and conditions described in NUREG/CR-7111 with respect to a loss of tendon prestress forces have subsequently been reviewed and found to have been adequately addressed by the 2008 assessment.

   OE example 1 provides objective evidence that self-assessments are performed to verify compliance with requirements, plant and industry OE is considered, and corrective actions are taken if deficiencies are identified.

2. In 2012, a calculation was developed to provide information related to *Concrete Containment Unbonded Tendon Prestress* AMP as it related to the tendon prestress TLAA. The calculation was performed as part of Oconee LR implementation. The tendon prestress TLAA calculation provided evidence that the loss of containment tendon prestress is adequately managed consistent with 10 CFR 54.21 (c)(1)(iii) during the PEO.

   Acceptance criteria for tendon surveillance were identified as given in terms of prescribed lower limits and minimum required values and shown in Oconee implementing documents. It was documented that each prescribed lower limit line was extended to 60 years of plant operation and remain above the minimum required values for all three tendon groups. The calculation also provides a comprehensive basis for any further activities that may be required for this program.

The calculation documented that the surveillance requirements include examinations of post-tensioning system and trending of prestressing forces in tendons in accordance with Section XI*, Subsection IWL* of the ASME Boiler and Pressure Vessel Code. In addition to the random sampling used for tendon examination, one tendon of each type is selected from the first-year inspection sample and designated as a common tendon. The common tendons are examined every ten years (+/-12 months). Any condition which fails to meet the acceptance standards of Section XI, *Subsection IWL* is considered an indication of abnormal degradation requiring corrective actions. It was concluded that the testing and trending requirements within the AMP will maintain prestressing forces above minimum levels required, through the first PEO.

The calculation documented that the tendon surveillances done to date have not identified any adverse trends in the tendon prestress forces. The TLAA calculation provided the basis to conclude that the continuation of the *Containment Tendon Surveillance* Program, in accordance with Section XI, *Subsection IWL* of the ASME Boiler and Pressure Vessel Code, and the testing and trending required by this AMP will ensure prestressing forces remain above minimum levels, through the PEO.

OE example 2 provides objective evidence of programmatic aspects of the existing *Concrete Containment Unbonded Tendon Prestress* AMP that contribute to effectively monitor and manage the containment tendon prestress forces. This example provides objective evidence that plant-specific and industry OE that potentially involves aging is evaluated and used to adjust the program as necessary.

3. During the Oconee Unit 3 40th year surveillance in 2015, a small increase in the prestress force in two common tendons was observed. The measured increase in the tendon prestress forces was less than 1% of the total tendon prestress force. The evaluation of the examination results identified that an increase in the tendon prestress force for two common tendons had been measured and compared the magnitude of the accuracy of the measurements. In accordance with IWL-2522(b), the accuracy of the calibration shall be within 1.5% of the specified minimum ultimate strength of the tendon. It was determined that the that the magnitude of the small increase was within the allowable margin in the accuracy of the tendon lift-off force measurements.

   OE example 3 provides objective evidence that upward trending tendon measurements are further assessed as part of the development of the Section XI, *Subsection IWL* examination reports. This OE provides objective evidence that program inspection methods effectively monitor tendon prestress values, and that appropriate aging management will be performed during the SPEO.

4. During tendon surveillances conducted on Unit 1 during 2016, lift-off examinations were performed on either end of a tendon located adjacent to the top of the steam generator replacement opening and is located in existing concrete. This is an augmented examination associated with repair and replacement activities during the steam generator replacement, required in accordance with IWL-2521.2. This work was performed per work

management processes. The liftoff exam for End 1 of the subject tendon was performed and the maximum ram pressure was achieved without successful liftoff. The liftoff of End 2 of the subject tendon was performed and liftoff was achieved at an average ram pressure that equates to approximately 440 kips. The minimum required value tendon force is 565 kips. The predicted lower limit is 634.7 kips, which accounts for tendon relaxation after original tensioning. The recorded liftoff of End 2 was less than the minimum required value, less than the predicted lower limit, and significantly lower than End 1. The condition was entered into the corrective action program, which directed that lift-off testing be repeated and witnessed by engineering. During the repeat lift-off test, the subject tendon successfully met the acceptance criteria. Based on the retest, it was concluded there was a discrepancy in the performance and documentation of the initial test.

OE example 4 provides objective evidence that program inspections, along with the corrective action program, will effectively monitor in scope SSCs to assure that these components will continue to perform their intended functions, and that appropriate aging management will be performed during the SPEO.

5. In 2017, a calculation was developed to consolidate the documentation of tendon prestress forces from original construction and subsequent inservice inspections that are used to determine tendon force trends, which are used in the evaluation of tendon forces in accordance with IWL-3221.1(c). The consolidated data documented in this calculation provides the means for trending of tendon forces to be used in evaluation of inservice inspection surveillance results in order to meet the code requirements presented in ASME Section XI, *Subsection IWL*. It was found that the current trends indicate tendon prestress losses consistent with predicted values and that some tendon groups have a higher probability of being lower than predicted values. No tested values were found lower than minimum required values. No changes to the AMP were recommended.

   OE example 5 provides objective evidence of programmatic aspects of the existing *Concrete Containment Unbonded Tendon Prestress* AMP that contribute to effectively monitoring and managing the containment tendon prestress forces. This operating experience provides objective evidence that the corrective action program is used to resolve discrepancies in test results, and drives additional actions to resolve the discrepancies.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Concrete Containment Unbonded Tendon Prestress* AMP will be effective in managing aging effects prior to loss of intended function during the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Concrete Containment Unbonded Tendon Prestress* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

Conclusion

The implementation of the *Concrete Containment Unbonded Tendon Prestress* AMP will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

B4.0 Plant-Specific Aging Management Programs

B4.1 Secondary Shield Wall Tendon Surveillance

Program Description

The *Secondary Shield Wall Tendon Surveillance* AMP is an existing condition monitoring program that manages aging effects associated with the tendons and tendon anchorage in the reactor building secondary shield wall. The secondary shield wall tendon system assures the structural adequacy of the secondary concrete shield wall, which provides structural support, shelter and protection to safety related systems, structures, and components. There are no preventive or mitigative actions associated with this program. The program manages for loss of material, cracking, and loss of tendon prestress by conducting visual inspections and tendon lift-off tests in accordance with station procedures. These are performed on three randomly selected horizontal tendons every other outage. Acceptance criteria outlined in station specifications and procedures ensures appropriate corrective actions are taken based on the observed and/or measured conditions. If an inspection identifies a degraded condition associated with a tendon or the tendon anchorage, the corrective action program is utilized to facilitate repair or replacement activities.

Aging Management Program Elements

The results of an evaluation of each element against the 10 elements described in Appendix A of NUREG-2192, *Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants*, are provided below.

Scope of Program – Element 1

The plant-specific *Secondary Shield Wall Tendon Surveillance* AMP includes the tendon wires and tendon anchorage hardware, including bearing plates, anchor-heads, bushing, button-heads, and shims of the Units 1, 2, and 3 secondary shield wall tendons.

The primary purpose of the secondary shield wall is to resist the pressure and jet loads resulting from a design postulated pipe rupture. The secondary shield walls are designed so that sections can be removed. The structural adequacy of the removable sections is assured by the associated post-tensioned tendon assemblies. The primary strength of the removable sections of the wall is provided by horizontal tendons as well as conventional reinforcing bars in each panel. Vertical tendons provide continuity through the horizontal joints. The remaining portions of the secondary shield walls are of conventional concrete design. The steam generator lateral supports attach to the inner face of the secondary shield wall. The tendon system is designed in accordance with ACI 318-63. Each tendon is comprised of ninety (90) 0.25” diameter wires.

Preventive Actions – Element 2

The existing AMP is a condition monitoring activity. There are no preventative or mitigative actions associated with this AMP.

Parameters Monitored or Inspected – Element 3

The *Secondary Shield Wall Tendon Surveillance* program utilizes visual inspections to inspect for loss of material and cracking of tendon anchorage, bearing plates, and shims. Tendon wires are inspected for loss of material and breakage, and button-heads are inspected for cracks, splits or broken button-heads. The program also monitors for loss of preload (prestress) by comparing measured lift-off forces to the established minimum required force for each tendon group, as described in station procedures.

Oconee performs visual inspections and lift-off tests on three randomly selected horizontal tendons every other refueling outage.

Detection of Aging Effects – Element 4

The *Secondary Shield Wall Tendon Surveillance* AMP detects aging effects prior to the loss of the secondary shield wall tendon intended function. This AMP is based on performing secondary shield wall tendon surveillances in accordance with site specific procedures.

Visual inspections and lift-off tests are performed on three randomly selected horizontal tendons every other refueling outage. Visual inspections include looking for moisture, discoloration, foreign matter, rust, corrosion, splits or cracks in the button-heads, broken or missing wires, and other obvious damage.

Lift-off testing is performed on a selected number of tendons every other refueling outage. Lift-off forces are measured and compared to established acceptance criteria.

Monitoring and Trending – Element 5

Condition monitoring for degradation of tendon wires and anchorage is performed by periodic visual inspections, looking for loss of material and cracking. The program also requires monitoring loss of prestress by comparing the measured lift-off forces to the established minimum required force for each tendon group, as specified in station procedures. Station procedures will be enhanced to include reviewing previous visual inspection results for tendon wires and anchorages condition, and lift-off results for the tendons selected for inspection.

Acceptance Criteria – Element 6

The acceptance criteria includes no unacceptable visual indication of moisture, discoloration, foreign matter, rust, corrosion, splits or cracks in the button-heads, broken or missing wires, and other obvious damage. Station procedures define limits of acceptability. Areas that do not meet the acceptance criteria are evaluated for continued service or corrected by repair or replacement.

Lift-off forces are measured and compared to established acceptance criteria described in station procedures. The minimum required forces for the tendon groups range from 390 kips to 560 kips depending on the location of the group. Tendons that do not meet the required lift-off forces are subject to remedial actions such as retensioning or replacement.

Corrective Actions – Element 7

Results that do not meet acceptance criteria are addressed as conditions adverse to quality or significant conditions adverse to quality in the Duke Energy corrective action program. The corrective action program is implemented in accordance with the requirements of 10 CFR 50, Appendix B, Criterion XVI and *Duke Energy Topical Report*. *Duke Energy Topical Report* is incorporated by reference into the Oconee UFSAR. A single program is used regardless of the safety classification of the structure or component. Conditions adverse to quality, such as failures, malfunctions, deviations, defective material and equipment, and non-conformances, are promptly identified and corrected. Corrective actions are implemented through the initiation of a nuclear condition report for actual or potential problems, correction of an equipment deficiency, or the need for corrective maintenance. Site documents that implement AMPs for LR direct that a nuclear condition report be prepared in accordance with those procedures whenever non-conforming conditions are found (i.e., the acceptance criteria are not met). The corrective action procedures specify steps for promptly reporting, evaluating, and correcting conditions adverse to quality and significant conditions adverse to quality commensurate with the significance of the SSC or activity.

The QA program is described in the *Duke Energy Corporation Topical Report,* which implements the requirements of 10 CFR 50, Appendix B, *"Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."* The Duke Energy QA program includes the three elements of corrective actions, confirmation process, and administrative controls, which are applicable to the safety related and non-safety related structures, components and commodity groups that are subject to aging management review.

Inspections are performed in accordance with station procedures. The results of the inspection determine if the tendon is acceptable as is or in need of repairs such as re-tensioning with re-inspection during the subsequent inspection or replacement. This process ensures that the tendon intended function will be maintained consistent with the CLB through the SPEO.

Confirmation Process – Element 8

The Duke Energy corrective action program contains confirmation process measures for assuring that conditions adverse to quality are promptly identified and corrected. The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting and precluding repetition of adverse conditions. The corrective action program stresses that verification of implementation and close-out of corrective action documentation take place and contains measures to monitor these activities by facility and oversight personnel.

Plant procedures, including procedures related to AMPs required for SLR, include provisions for timely evaluation of adverse conditions and implementation of corrective actions required, including root cause evaluations and prevention of repetition where appropriate (e.g., significant conditions adverse to quality).

The corrective action program procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating and approving corrective actions, and ensure that corrective actions have been effectively implemented. The corrective action process is also monitored for potentially adverse trends. Identification of a potentially adverse trend due to recurring or repetitive unacceptable conditions will result in the initiation of a nuclear condition report.

The QA program is described in the *Duke Energy Corporation Topical Report*, which implements the requirements of 10 CFR 50, Appendix B, *"Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."* As noted in the QA program topical report, the Duke Energy QA program includes the three elements of corrective actions, confirmation process, and administrative controls, which are applicable to the safety related and non-safety related structures, components and commodity groups that are subject to aging management review.

The *Secondary Shield Wall Tendon Surveillance* program does not rely on NRC endorsed technical or topical reports.

Administrative Controls – Element 9

Administrative controls apply to both safety related and non-safety related structures, components and commodity groups within the scope of this program which are subject to aging management review.

The QA program is described in the *Duke Energy Corporation Topical Report*, which implements the requirements of 10 CFR 50, Appendix B, *"Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."* As noted in the QA program topical report, the Duke Energy QA program includes the three elements of corrective actions, confirmation process, and administrative controls, which are applicable to the safety related and non-safety related structures, components and commodity groups that are subject to aging management review.

Administrative controls apply to applicable activities, documents, procedures, and instructions regardless of the safety classification of the associated system, structure, component, or commodity group. Administrative controls also provide for formal review and approval of corrective actions.

Operating Experience – Element 10

Based on a broad search of pertinent Oconee OE, the following examples provide objective evidence that the *Secondary Shield Wall Tendon Surveillance* AMP will continue to be effective in managing aging effects for SSCs within the scope of the program so that intended functions will be maintained consistent with the current licensing basis for the SPEO. This broad search included the corrective action program, metallurgical laboratory reports, programmatic inspection results and effectiveness reviews for existing AMPs.

1. In September 2020, an AMP effectiveness review was performed on the *Secondary Shield Wall Tendon Surveillance* program. The *Secondary Shield Wall Tendon Surveillance* program was evaluated against the performance criteria identified in NEI 14-12 "Aging Management Program Effectiveness." The review concluded that the program is meeting the requirements of NEI 14-12. No gaps were identified during the effectiveness review, however one enhancement was identified. The review assessed multiple aspects of the *Secondary Shield Wall Tendon Surveillance* AMP, including

commitment management, implementing activity completion and results documentation, corrective actions, and OE.

The enhancement identified is associated with tendon prestress losses. While tendon prestress losses remain above the minimum required value, they are decaying at a quicker rate than expected. Corrective actions are in place for engineering to continue monitoring and evaluating the decay rate to determine the appropriate next steps such as additional analysis on the minimum required value or re-tensioning tendons per stations procedures.

This effectiveness review provides objective evidence that the current *Secondary Shield Wall Tendon Surveillance* program is effectively managing aging and meeting all current LR commitments. This provides reasonable assurance that ongoing program effectiveness will continue in the SPEO.

2. Condition reports entered in the corrective action program identified Unit 1 (2011) and Unit 3 (2010) tendon lift-off forces that were less than 50 kips above the minimum required value (per station procedure on acceptance criteria). Station procedures state acceptance criteria requires tendon lift-off forces being greater than the minimum required force, but if the forces are less than the minimum required value plus 50 kips, results are acceptable but are subject to remedial actions like re-tensioning. Engineering evaluated each of these instances and decided not to re-tension the tendons. This was based on ASME Section XI acceptance criteria (only requires minimum required value be met), testing experience which has shown aggressive re-tensioning of secondary shield wall tendons causes loss of prestress in adjacent tendons, and engineering judgment that additional tendon force relaxation is not expected.

   Additional actions stemming from these tendon lift-off observations included re-analysis of the minimum required prestress forces for the secondary shield wall tendons, and procedural changes that may be required based on the results of the re-analysis.

   OE example 2 provides objective evidence that program inspections, along with the corrective action program, will effectively monitor in scope SSCs to assure that these components will continue to perform their intended functions, and that appropriate aging management will be performed during the SPEO.

3. In November 2018, while performing Unit 1 secondary shield wall tendon surveillance, indications were identified on the stressing washer and bushing for SW5. The bushing showed slight rust. Photos of the indications were taken and an evaluation was performed. The evaluation determined that the indications were acceptable and no repairs were required. The remaining parts of the anchorage (button-head, bearing plate, shims) were acceptable. A lift-off was also performed with acceptable results.

   OE example 3 provides objective evidence that program inspections, along with the corrective action program, will effectively monitor in scope SSCs to assure that these components will continue to perform their intended functions, and that appropriate aging management will be performed during the SPEO.

The above examples of OE provide objective evidence that the aging management activities and methods being implemented by the *Secondary Shield Wall Tendon Surveillance* AMP will be effective in managing aging effects prior to loss of intended function during the SPEO.

Appropriate guidance for evaluation or corrective actions for additional inspections, reevaluation, repairs, or replacements is provided for locations where aging effects are found. Periodic assessments of the *Secondary Shield Wall Tendon Surveillance* AMP are performed to identify the areas that need improvement to maintain effective performance of the program. The program is informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry OE.

<u>NUREG-2191 Consistency</u>

The *Secondary Shield Wall Tendon Surveillance* AMP is not described in NUREG-2191. The *Secondary Shield Wall Tendon Surveillance* AMP is an existing Oconee plant-specific AMP that will be consistent with the ten elements of an AMP described in NUREG-2192, *"Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants"* with the enhancement noted below.

<u>Exception to NUREG-2191</u>

Plant-Specific Program

<u>Enhancements</u>

The following enhancements will be implemented in the following program element: Monitoring and Trending (Element 5)

1. Enhance station procedures to include a review of previous visual inspection and lift-off data results for the tendons selected for inspection. (Element 5)

<u>Conclusion</u>

The implementation of the *Secondary Shield Wall Tendon Surveillance* AMP, with the noted enhancement, will provide reasonable assurance that the identified aging effects will be adequately managed so that the intended functions of components within the scope of this program will be maintained consistent with the CLB during the SPEO.

Oconee Nuclear Station

Units 1, 2, and 3

Application for Subsequent License Renewal

Appendix C
MRP-227-A GAP ANALYSIS

C1.0 INTRODUCTION

This appendix is not used for the Oconee Nuclear Station Subsequent License Renewal Application.

Oconee Nuclear Station

Units 1, 2, and 3

Application for Subsequent License Renewal

Appendix D

Technical Specification Changes

APPENDIX D

TECHNICAL SPECIFICATION CHANGES

10 CFR 54.22 requires that an application for LR include any Technical Specification changes or additions necessary to manage the effects of aging during the PEO.

No Technical Specification changes or additions were identified as necessary to manage the effects of aging during the SPEO and as such no Technical Specification changes or additions are included with this SLRA.