Brunswick Steam Electric Plant

License Renewal Application

PREFACE

The following describes the content of the BSEP License Renewal Application.

Chapter 1 provides the administrative information required by 10 CFR 54.17 and 10 CFR 54.19.

Chapter 2 describes and justifies the methodology used to determine the systems, structures, and components within the scope of license renewal and the structures and components subject to an aging management review. The results of applying the scoping methodology are provided in Tables 2.2-1, 2.2-2, and 2.2-3. These tables provide listings of the mechanical systems, structures, and electrical/instrumentation and control systems within the scope of license renewal. Chapter 2 also provides a description of the systems and structures and their intended functions and tables identifying the system and structure components/commodities requiring aging management review and their intended functions. The descriptions also identify the applicable license renewal boundary drawings for mechanical systems. The drawings are included in a separate submittal. A discussion of the NRC Interim Staff Guidance topics for license renewal is included as a subsection of Chapter 2.

Chapter 3 describes the results of aging management reviews of structures and components requiring aging management review. Chapter 3 is divided into six sections that address the areas of: (1) Reactor Vessel, Internals, and Reactor Coolant System, (2) Engineered Safety Features, (3) Auxiliary Systems, (4) Steam and Power Conversion Systems, (5) Containments, Structures, and Component Supports, and (6) Electrical and Instrumentation and Controls. The tables in Chapter 3 provide a summary of information concerning aging effects requiring management and applicable aging management programs for structures and components. The information presented in the tables is based on industry guidance for format and content of applications that rely on NUREG-1800, “Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants,” U. S. Nuclear Regulatory Commission, April 2001, (the SRP-LR). The tables provide a discussion of the applicability of the component commodity groups to BSEP and information regarding the degree to which proposed aging management programs are consistent with those recommended in NUREG-1801, “Generic Aging Lessons Learned (GALL),” U.S. Nuclear Regulatory Commission, April 2001, (the GALL Report).

Chapter 4 addresses Time-Limited Aging Analyses, as defined by 10 CFR 54.3, and includes the identification of the component or subject, and an explanation of the time-dependent aspects of the calculation or analysis. Chapter 4 demonstrates whether (1) the analyses remain valid for the period of extended operation, or (2) the analyses have been projected to the end of the period of extended operation, or (3) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. Chapter 4 also provides the results of a review of exemptions issued pursuant to 10 CFR 50.12 to determine if any involve a Time-Limited Aging Analysis.

Appendix A, Updated Final Safety Analysis Report Supplement, provides a summary description of the programs and activities for managing the effects of aging during the period of extended operation. A summary description of the evaluation of Time-Limited Aging Analyses for the period of extended operation is also included.

Appendix B, Aging Management Programs, describes the programs and activities that are credited to assure the effects of aging of components and structures will be managed such that they will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. Appendix B also addresses programs that are credited in the evaluation of Time-Limited Aging Analyses.

Appendix C is not used.

Appendix D, Technical Specification Changes, concludes that no technical specification changes are necessary to manage the effects of aging during the period of extended operation.

A supplement to the Environmental Report is provided in Appendix E, entitled, “Applicant’s Environmental Report – Operating License Renewal Stage.”

The information in Chapter 2, Chapter 3, and Appendix B fulfills the requirements in 10 CFR 54.21(a). Section 1.4 discusses how the requirements of 10 CFR 54.21(b) will be met. The information in Chapter 4 fulfills the requirements in 10 CFR 54.21(c). The information in Appendix A and Appendix D fulfills the requirements in 10 CFR 54.21(d) and 10 CFR 54.22, respectively. Appendix E provides the environmental information required by 10 CFR 54.23.

ACRONYMS AND ABBREVIATIONS

AC	Alternating Current
ACI	American Concrete Institute
ACSR	Aluminum Conductor Steel Reinforced
ADS	Automatic Depressurization System
AERM	Aging Effects Requiring Management
AFFF	Aqueous Fire Fighting Foam
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMP	Aging Management Program
AMR	Aging Management Review
ANSI	American National Standards Institute
AOG	Augmented Off-Gas/Auxiliary Off-Gas
AOO	Anticipated Operational Occurrence
API	American Petroleum Institute
APRM	Average Power Range Monitor
ARI	Alternate Rod Injection/Alternate Rod Insertion
ARM	Area Radiation Monitor
ART	Adjusted Reference Temperature
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
AST	Alternative Source Term
ASTM	American Society for Testing and Materials
ATWS	Anticipated Transient Without Scram
ATWS-RPT	Anticipated Transient Without Scram-Recirculation Pump Trip
AWS	American Welding Society
AWWA	American Water Works Association
B&PV	Boiler and Pressure Vessel
BNP	Brunswick Nuclear Plant
BSEP	Brunswick Steam Electric Plant
BTP	Branch Technical Position
BWR	Boiling Water Reactor
BWROG	Boiling Water Reactor Owners Group
BWRVIP	Boiling Water Reactor Vessel and Internals Program
CAC	Containment Atmospheric Control
CAD	Containment Atmosphere Dilution
CAP	Corrective Action Program
CB	Control Board
CCW	Component Cooling Water/Closed Cooling Water
CDD	Condensate Deep Bed Demineralizer
CF	Chemistry Factor
CFD	Condensate Filter Demineralizer
CHRS	Containment Heat Removal System
CL	Chlorination
CLB	Current Licensing Basis
CMAA	Crane Manufacturers Association of America
CP&L	Carolina Power & Light Company, a Progress Energy Company

ACRONYMS AND ABBREVIATIONS

CRD	Control Rod Drive
CRDH	Control Rod Drive Housing
CRDM	Control Rod Drive Mechanism
CS	Core Spray/Carbon Steel
CSCS	Core Standby Cooling System
CST	Condensate Storage Tank
CW	Circulating Water
CUF	Cumulative Usage Factor
DBA	Design Basis Accident
DBE	Design Basis Earthquake
DC	Direct Current
DG	Diesel Generator
DGB	Diesel Generator Building
DOR	Division of Operating Reactors (NRC)
D/P	Differential Pressure
DSCSS	Drywell and Suppression Chamber Spray System
DWT	Demineralized Water Tank
EAF	Environmentally Assisted Fatigue
E&RC	Environmental and Radiation Control
ECC	Emergency Core Cooling
ECCS	Emergency Core Cooling System
EDB	(PassPort) Equipment Database
EFPY	Effective Full Power Years
EHC	Electro-Hydraulic Control
EMA	Equivalent Margin Analysis
EOF	Emergency Operations Facility
EPA	Electrical Penetration Assembly
EPRI	Electric Power Research Institute
EPU	Extended Power Uprate
EQ	Environmental Qualification
EQML	Environmental Qualification Master List
ER	Environmental Report
ESF	Engineered Safety Features
FAC	Flow Accelerated Corrosion
Fen	Environmental Fatigue Factor
FERC	Federal Energy Regulatory Commission
FHA	Fire Hazards Analysis
FO	Fuel Oil
FOL	Facility Operating License
FOST	Fuel Oil Storage Tank
FP	Fire Protection
FPP	Fire Protection Program
FSAR	Final Safety Analysis Report
FSER	Final Safety Evaluation Report
FW	Feedwater
GALL	Generic Aging Lessons Learned (the GALL Report is NUREG-1801)
GDC	General Design Criteria

ACRONYMS AND ABBREVIATIONS

GE	General Electric
GL	Generic Letter
GSI	Generic Safety Issue
HCU	Hydraulic Control Unit
HD	Heater Drains
HDFSS	High Density Fuel Storage System
HELB	High Energy Line Break
HEPA	High Efficiency Particulate Air
HMWPE	High Molecular Weight Polyethylene
HP	High Pressure
HPCI	High Pressure Coolant Injection
HPCS	High Pressure Core Spray (not an applicable system for BSEP)
HVAC	Heating, Ventilating, and Air Conditioning
HWC	Hydrogen Water Chemistry
IA	Instrument Air
IAN	Non-interruptible Instrument Air
IASCC	Irradiation Assisted Stress Corrosion Cracking
I&C	Instrumentation and Control
ID	Inside Diameter
IE	Inspection and Enforcement (former NRC Office of Inspection and Enforcement)
IEEE	Institute Of Electrical And Electronic Engineers
IGSCC	Intergranular Stress Corrosion Cracking
ILRT	Integrated Leak Rate Test (Containment Type A Test)
IN	Information Notice
INPO	Institute Of Nuclear Power Operations
IPCEA	Insulated Power Cable Engineers Association
IPA	Integrated Plant Assessment (10 CFR 54.21(a))
IR	Insulation Resistance
IRM	Intermediate Range Monitor
ISG	Interim (NRC) Staff Guidance
ISI	In-Service Inspection
KV	Kilovolt
LBB	Leak-Before-Break
LER	Licensee Event Report
LO	Lubricating Oil
LOCA	Loss of Coolant Accident
LP	Low Pressure
LPCI	Low Pressure Coolant Injection
LPCS	Low Pressure Core Spray
LPRM	Local Power Range Monitor
LR	License Renewal
LRA	License Renewal Application
MCB	Main Control Board
MeV	Million Electron Volts
MIC	Microbiologically Induced Corrosion
MOD	Motor Operated Disconnect
MS	Main Steam

ACRONYMS AND ABBREVIATIONS

MSIV/LCS	Main Steam Isolation Valve/ Leakage Control System
MSL	Main Steam Line/Mean Sea Level
MSLB	Main Steam Line Break
MSR	Moisture Separator Reheater
MVD	Miscellaneous Vents and Drains
MWTS	Makeup Water Treatment System
NDE	Nondestructive Examination
NDTT	Nil-Ductility Transition Temperature
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
Ni	Nickel
NMS	Neutron Monitoring System
NPS	Nominal Pipe Size
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
NUREG	Designation of publications prepared by the NRC staff
OE	Operating Experience
OLTP	Original Licensed Thermal Power
OPRM	Oscillation Power Range Monitor
PASS	Post-Accident Sampling System
PBDS	Period Based Detection System
PCB	Power Circuit Breaker
PCS	Primary Containment Structure
PEC	Progress Energy Carolinas
PFM	Probabilistic Fracture Mechanics
pH	Concentration of Hydrogen Ions
PM	Preventive Maintenance
PNS	Pneumatic Nitrogen System
PORV	Power-Operated Relief Valve
PRM	Process Radiation Monitoring
P-T	Pressure-Temperature
PTS	Pressurized Thermal Shock
PVC	Polyvinyl Chloride
PWS	Potable Water System
QA	Quality Assurance
RAI	Request for Additional Information
RBCCW	Reactor Building Closed Cooling Water
RBM	Rod Block Monitor
RCIC	Reactor Core Isolation Cooling
RCPB	Reactor Coolant Pressure Boundary
RFP	Reactor Feedwater Pump
RG	Regulatory Guide
RHR	Residual Heat Removal
RI	Risk Informed
RMCS	Reactor Manual Control System
RMS	Radiation Monitoring System
RNA	Reactor Non-interruptible Air

ACRONYMS AND ABBREVIATIONS

RPIS	Rod Position Information System
RPS	Reactor Protection System
RPV	Reactor Pressure Vessel
RT_{NDT}	Reference Temperature, Nil-Ductility Transition
$RT_{NDT(U)}$	Reference Temperature, Nil-Ductility Transition (Unirradiated)
RVI	Reactor Vessel Internals
RWCU	Reactor Water Cleanup System
RWM	Rod Worth Minimizer
RXS	Reactor Building Sampling System
SA	Service Air
SAT	Startup Auxiliary Transformer
SBO	Station Blackout
SC	Structure/Component (10 CFR 54.21(a)(1)), also Suppression Chamber
SCC	Stress Corrosion Cracking
SCW	Screen Wash Water
SDV	Scram Discharge Volume
SE	Safety Evaluation
SER	Safety Evaluation Report
SFP	Spent Fuel Pool
SGTS	Standby Gas Treatment System
SI	Safety Injection
SJAE	Steam Jet Air Ejector
SLC	Standby Liquid Control
SLMS	Stator Leak Monitoring System
SPDS	Safety Parameter Display System
SR	Safety Related
SRM	Source Range Monitoring
SRP	Standard Review Plan
SRP-LR	Standard Review Plan for License Renewal
SRV	Safety Relief Valve
SS	Stainless Steel
SSC	Systems, Structures, and Components (10CFR 54.4(a))
SSE	Safe Shutdown Earthquake
SW	Service Water
TAC	Technical Assignment Control (internal NRC work management tool)
TASCS	Thermal Stratification, Cycling, and Striping
TB	Turbine Building
TBCCW	Turbine Building Closed Cooling Water
TGSCC	Trans-Granular Stress Corrosion Cracking
TID	Total Integrated Dose
TIP	Traversing Incore Probe
TLAA	Time-Limited Aging Analysis
TSC	Technical Support Center
TT	Thermal Transients
UAT	Unit Auxiliary Transformer
UFSAR	Updated Final Safety Analysis Report
USAS	United States of America Standards

ACRONYMS AND ABBREVIATIONS

USE	Upper Shelf Energy
UUSE	Unirradiated Upper Shelf Energy
UT	Ultrasonic Test
VAC	Volts alternating current
VDC	Volts direct current
VFLD	Vessel Flange Leak Detection
XLPE	Cross-linked Polyethylene
XLPO	Cross-linked Polyolefin
WANO	World Association of Nuclear Operators

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

1.0 ADMINISTRATIVE INFORMATION

1.1 PURPOSE AND GENERAL INFORMATION

In accordance with the requirements of Part 54 of Title 10 of the Code of Federal Regulations (10 CFR 54), Carolina Power & Light Company, doing business as Progress Energy Carolinas, Inc., a subsidiary of Progress Energy, Inc., has prepared this application to provide the technical and environmental information required for renewal of the operating licenses for the Brunswick Steam Electric Plant, Units 1 and 2, also referred to as BSEP 1 and 2. This application supports License Renewal for an additional 20-year period beyond the end of the current license terms of BSEP Facility Operating Licenses DPR-71, for Unit 1, and DPR-62, for Unit 2. The end of the current license term is September 8, 2016, for Unit 1 and December 27, 2014, for Unit 2. The technical information consists of (1) an Integrated Plant Assessment, as defined in 10 CFR 54.21(a), (2) an evaluation of time-limited aging analyses, as defined in 10 CFR 54.21(c), (3) a supplement to the BSEP Updated Final Safety Analysis Report (UFSAR), as required by 10 CFR 54.21(d), and (4) environmental information, as required by 10 CFR 54.23. The environmental information is provided as a separate appendix to the application, Appendix E, entitled “Applicant’s Environmental Report – Operating License Renewal Stage.”

This application and supporting environmental report are intended to provide sufficient information for the NRC to complete its technical and environmental reviews and allow the NRC to make the finding required by 10 CFR 54.29 in support of the issuance of renewed operating licenses for BSEP 1 and 2. The following is the application filing and content information required by 10 CFR 54.17 and 10 CFR 54.19.

1.1.1 NAME OF APPLICANT

Carolina Power & Light Company, doing business as,
Progress Energy Carolinas, Inc.

1.1.2 ADDRESS OF APPLICANT

Progress Energy Carolinas, Inc.
410 S. Wilmington Street
Raleigh, NC 27601-1748

Address of Brunswick Steam Electric Plant:

Progress Energy Carolinas, Inc.
Brunswick Steam Electric Plant
P. O. Box 10429, Highway 87N
Southport, NC 28461

1.1.3 OCCUPATION OF APPLICANT

Carolina Power & Light Company, doing business as Progress Energy Carolinas, Inc. (PEC, the Company), is a corporation primarily engaged in the generation, transmission, distribution, and sale of electricity in portions of North and South Carolina. The Company serves more than 1.3 million customers in a territory encompassing over 34,000 square miles including the cities of Raleigh, Wilmington, Fayetteville, and Asheville in North Carolina and Florence and Sumter in South Carolina.

1.1.4 ORGANIZATION AND MANAGEMENT OF APPLICANT

The Company is a corporation organized and existing under the laws of the State of North Carolina. The Company is not owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. The Company makes this application on its own behalf and is not acting as an agent or representative of any other person.

The names and addresses of Progress Energy directors and principal officers are listed below. All persons listed are U. S. citizens.

Director	Address
Edwin B. Borden	Goldsboro, NC
James E. Bostic Jr.	Atlanta, GA
David L. Burner	Charlotte, NC
Charles W. Coker	Hartsville, SC
Richard L. Daugherty	Raleigh, NC
W. D. (Bill) Frederick, Jr.	Orlando, FL
William O. McCoy	Chapel Hill, NC
Robert B. McGehee	Raleigh, NC
E. Marie McKee	Corning, NY
John H. Mullin, III	Brookneal, VA
Richard A. Nunis	Orlando, FL
Peter S. Rummell	Jacksonville, FL
Carlos A. Saladrigas	Miami, FL
Jean Giles Wittner	St. Petersburg, FL

Principal Officers	Address
Robert B. McGehee Chairman, President and Chief Executive Officer Progress Energy	Progress Energy, Inc. 410 S. Wilmington Street Raleigh, NC 27601-1748
William D. Johnson Group President - Energy Delivery Progress Energy Carolinas and Progress Energy Florida	Progress Energy, Inc. 410 S. Wilmington Street Raleigh, NC 27601-1748
William S. Orser Group President - Energy Supply Progress Energy Carolinas and Progress Energy Florida	Progress Energy, Inc. 410 S. Wilmington Street Raleigh, NC 27601-1748
Tom D. Kilgore President and Chief Executive Officer – Progress Energy Ventures, Group President - Progress Ventures	Progress Energy, Inc. 410 S. Wilmington Street Raleigh, NC 27601-1748
Don K. Davis Executive Vice President - Rail and Telecom Progress Energy	Progress Energy, Inc. 410 S. Wilmington Street Raleigh, NC 27601-1748
Peter M. Scott III President and Chief Executive Officer - Progress Energy Service Company	Progress Energy Service Company, LLC 410 S. Wilmington Street Raleigh, NC 27601-1748
Fred N. Day IV President and Chief Executive Officer Progress Energy Carolinas	Progress Energy, Inc. 410 S. Wilmington Street Raleigh, NC 27601-1748
H. William Habermeyer, Jr. President and Chief Executive Officer Progress Energy Florida	Progress Energy, Inc. 100 Central Avenue St Petersburg, Fl 33701
Geoffrey S. Chatas Executive Vice President and Chief Financial Officer - Progress Energy	Progress Energy Florida 410 S. Wilmington Street Raleigh, NC 27601-1748

Principal Officers	Address
C. S. Hinnant Senior Vice President and Chief Nuclear Officer – Nuclear Generation Progress Energy	Progress Energy, Inc. 410 S. Wilmington Street Raleigh, NC 27601-1748
E. Michael Williams Senior Vice President - Power Operations Progress Energy Carolinas and Progress Energy Florida	Progress Energy, Inc. 410 S. Wilmington Street Raleigh, NC 27601-1748
Bonnie V. Hancock President - Progress Fuels Corporation	Progress Energy Ventures, Inc. 410 S. Wilmington Street Raleigh, NC 27601-1748
Jeffrey J. Lyash Senior Vice President – Energy Delivery Progress Energy Florida	Progress Energy, Inc. 100 Central Avenue St Petersburg, Fl 33701-3324
John R. McArthur Senior Vice President – Corporate Relations Progress Energy Service Company General Counsel and Corporate Secretary	Progress Energy, Inc. 410 S. Wilmington Street Raleigh, NC 27601-1748

1.1.5 CLASS AND PERIOD OF LICENSE SOUGHT

The Company requests renewal of the Class 104b Facility Operating Licenses No. DPR-71 for BSEP, Unit 1, and DPR-62 for BSEP, Unit 2, for a period of 20 years beyond the expiration of the current licenses. Approval of this License Renewal request would extend the operating licenses for Unit 1 from midnight September 8, 2016, until midnight September 8, 2036 and for Unit 2 from midnight December 27, 2014, until midnight December 27, 2034. The Units would continue to be known as the Brunswick Steam Electric Plant, Units 1 and 2, and would continue to generate electric power during the period of extended operation. The Company also requests renewal of the source, byproduct, and special nuclear material licenses that are combined in the current operating licenses.

1.1.6 ALTERATION SCHEDULE

The Company does not propose to construct or alter any production or utilization facility in connection with this renewal application.

1.1.7 CHANGES TO THE STANDARD INDEMNITY AGREEMENT

10 CFR 54.19(b) requires that License Renewal applications 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 for BSEP 1 and 2 states in Article VII that the agreement shall terminate at the time of expiration of that license specified in Item 3 of the Attachment to the agreement, which is the last to expire. Item 3 of the Attachment to the indemnity agreement, as amended, lists BSEP 1 and 2 Operating Licenses DPR-71 and DPR-62. The Company requests that conforming changes be made to the indemnity agreement, and/or the Attachment to the agreement, as required, to specify the extension of the agreement until the expiration date of the renewed BSEP 1 and 2 operating licenses as sought in this application.

1.1.8 RESTRICTED DATA AGREEMENT

This application does not contain any Restricted Data or other defense information, and the Company does not expect that any activity under the renewed licenses will involve such information. However, if such information were to become involved, the Company agrees that it will appropriately safeguard such information and not permit any individual to have access to, or any facility to possess, such information until the individual or facility has been approved for such access under the provisions of 10 CFR Part 25 and/or 10 CFR Part 95.

1.2 DESCRIPTION OF THE BRUNSWICK STEAM ELECTRIC PLANT (BSEP)

BSEP is located south of Wilmington, NC at the mouth of the Cape Fear River in Brunswick County, NC. Major plant structures include Reactor Buildings, Turbine Building, Control Building, Radwaste Building, Diesel Generator Building, Nitrogen and Off-Gas Services Building, Circulating Water Intake Structure, and Service Water Intake Structure.

BSEP Units 1 and 2 are boiling water reactors (BWRs) designed and supplied by General Electric Nuclear Energy Company. The primary containments are of the BWR Mark I design; and each consists of a Drywell, a suppression chamber in the shape of a Torus and a connecting vent system between the Drywell and the suppression chamber. Each Drywell is constructed of reinforced concrete with a carbon steel liner. Each Unit is authorized to operate at 2,923 megawatts thermal. Plant equipment includes systems supporting reactor operation and systems for the processing of radioactive wastes, handling of fuel, electrical distribution, cooling, and power generation. Other onsite structures and facilities are provided to comprise a complete and operable nuclear power plant. The condenser cooling system uses once-through cooling water flow from the Cape Fear Estuary.

Additional descriptive information about BSEP systems, structures, and components is provided in later chapters of this application.

1.3 TECHNICAL INFORMATION REQUIRED FOR AN APPLICATION

In accordance with 10 CFR 54.21, four technical items are required to support an application for a renewed operating license. These are (1) an Integrated Plant Assessment (IPA), (2) an evaluation of time-limited aging analyses (TLAAs), (3) a supplement to the BSEP UFSAR that contains a summary description of the programs and activities for managing the effects of aging and the evaluation of the TLAAs, and (4) any changes to the current licensing basis (CLB) that occur during NRC review. In this application, the IPA information is provided in Chapter 2, Chapter 3 and Appendix B; the TLAA information, in Chapter 4; the UFSAR information, in Appendix A; and CLB changes are addressed in Section 1.4.

In addition to the technical information, 10 CFR 54.22 requires applicants to submit any Technical Specification changes or additions necessary to manage the effects of aging during the period of extended operation. As noted in Appendix D, no changes to the BSEP 1 and 2 Technical Specifications are required to support this application.

10 CFR 54.23 requires the application to include a supplement to the Environmental Report. A report entitled “Applicant’s Environmental Report – Operating License Renewal Stage” has been provided as Appendix E of the application.

The IPA, as defined by 10 CFR 54.3, is a licensee assessment that demonstrates that a nuclear power plant’s structures and components requiring aging management review in accordance with 10 CFR 54.21(a) for License Renewal have been identified. The IPA also demonstrates that the effects of aging on the functionality of such structures and components will be managed to maintain the current licensing basis during the period of extended operation. The BSEP IPA includes:

1. Identification of the structures and components within the scope of License Renewal that are subject to an aging management review;

2. Identification of the aging effects applicable to these structures and components;

3. Identification of plant-specific programs and activities that will manage these identified aging effects; and

4. A demonstration that these programs and activities will be effective in managing the effects of aging during the period of extended operation.

The IPA for License Renewal, along with other information necessary to document compliance with 10 CFR 54, is maintained in an auditable and retrievable form, in accordance with 10 CFR 54.37(a). The IPA is documented with site-specific reports and calculations that were generated in accordance with the BSEP Quality Assurance Program.

1.4 CURRENT LICENSING BASIS CHANGES DURING NRC REVIEW

Each year, following the submittal of the BSEP License Renewal Application and at least three months before the scheduled completion of the NRC review, the Company will submit amendments to the application pursuant to 10 CFR 54.21(b). The amendments will identify any changes to the current licensing basis that materially affect the contents of the License Renewal Application, including the UFSAR supplement and any other aspects of the Application.

1.5 ADDITIONAL RECORDS AND RECORD KEEPING REQUIREMENTS

In accordance with 10 CFR 54.37(b), CP&L, doing business as PEC, will incorporate into updates to the BSEP UFSAR required by 10 CFR 50.71(e) any newly identified SSCs that would have been subject to an aging management review or evaluation of time-limited aging analyses in accordance with 10 CFR 54.21 and describe how the effects of aging will be managed such that the intended functions of the SSCs are maintained during the period of extended operation.

As stated in the discussion of 54.37(b) in the Statements of Consideration for the revised License Renewal regulations (60 FR 22461, May 8, 1995), "[t]he Commission believes that it is important to note that the systems, structures, and components discussed in 54.37(b) are those *newly identified* systems, structures, and components that would have been subject to an aging management review in the License Renewal process. If identified as part of the License Renewal process, information concerning the aging management for these systems, structures, and components would have been contained in the application for License Renewal."

Upon issuance of a renewed license, guidance will be incorporated into administrative control procedures to identify existing SSCs not within the scope of License Renewal that, because of plant modifications or analysis revisions, are consequently determined to meet the scoping criteria of 10 CFR 54.4. These plant modifications or analysis revisions will also be reviewed to determine if any existing analysis would have been a TLAA. The information required by 10 CFR 54.37(b) for these newly identified SSCs will be incorporated into the UFSAR.

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

This chapter describes the process and results of identifying structures and components subject to an aging management review. 10 CFR 54.4 provides requirements for determining whether plant structures, systems, and components (SSCs) are in scope for license renewal. For those SSCs, 10 CFR 54.21(a)(1) requires a license renewal application to include an Integrated Plant Assessment (IPA) that identifies and lists the structures and components (SCs) subject to an aging management review. 10 CFR 54.21(a)(2) further requires that the methods used to identify and list these structures and components be described and justified. The technical information in this chapter is intended to satisfy these requirements.

The BSEP license renewal review methodology is consistent with the approach recommended in NEI 95-10, “Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule,” Revision 3, Nuclear Energy Institute, March 2001 (hereinafter referred to as NEI 95-10). The methodology consists of three processes: scoping, screening, and aging management reviews. These processes have been implemented in accordance with the BSEP Quality Assurance Program.

Scoping and screening methodologies are described in Section 2.1. The results of applying the methodology to identify the systems and structures within the scope of license renewal (scoping) are contained in Section 2.2. The results of applying the methodology for identification of components and structure components subject to an aging management review (screening) are contained in Section 2.3 for mechanical systems, Section 2.4 for structures, and in Section 2.5 for electrical and instrumentation and control (I&C) systems.

The information provided in this Chapter provides the basis for the NRC to make the finding required by 10 CFR 54.29(a)(1) regarding identification of the SCs that require aging management review.

The following table defines the meanings of abbreviations for intended functions used on the system and structure screening results tables provided in Sections 2.3, 2.4, and 2.5, and on the aging management review results tables provided in Chapter 3.0.

Table 2.0-1 Intended Function Abbreviations and Definitions

Intended Function	Abbreviation	Definition
Civil Intended Functions		
Pressure Boundary	C-1	Provide pressure boundary and/or fission product barrier
Structural/Functional Support [Criterion a(1) requirement]	C-2	Provide structural and/or functional support to safety related equipment
Shelter/Protection	C-3	Provide shelter/protection to safety related equipment
Fire Barrier	C-4	Provide rated fire barrier to confine or retard a fire from spreading to or from adjacent areas of the plant
Cooling Water	C-5	Provide source of cooling water for plant shutdown
Missile Barrier	C-6	Provide missile barrier
Structural/Functional Support [Criterion a(2) requirement]	C-7	Provide structural and /or functional support to non-safety related equipment where failure of this structural component could prevent satisfactory accomplishment of any of the required safety related functions
Flood Barrier	C-8	Provide a protective barrier for internal/external flood event
Discharge Flow Path	C-9	Provide a path for release of filtered or unfiltered gaseous discharge
Structural/Functional Support [Criterion a(3) requirement]	C-10	Provide structural support and/or shelter to components required for Fire Protection, Anticipated Transient Without Scram, and/or Station Black Out
Pipe Whip/Jet Impingement Protection	C-11	Provide pipe whip restraint and/or jet impingement protection
Heat Sink	C-12	Provide heat sink during SBO or design basis accidents
Spray Shield/Curb	C-13	Provide spray shield or curbs for directing flow
Electrical Intended Functions		
Electrical Continuity	E-1	Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current, or signals
Electrical Insulation	E-2	Insulate and support an electrical conductor
Mechanical Intended Functions		
Pressure Boundary	M-1	Provide pressure-retaining boundary (so that sufficient flow at adequate pressure is delivered or undesirable spatial interactions are prevented)
Filtration	M-2	Provide filtration
Throttle	M-3	Provide flow restriction (throttle)
Structural Support	M-4	Provide structural support/seismic integrity
Heat Transfer	M-5	Provide heat transfer
Thermal Insulation	M-6	Provide insulation/thermal resistance
Fission Product Barrier	M-7	Provide post accident containment, holdup, and plateout of MSIV bypass leakage
Spray Pattern	M-8	Provide adequate flow in a properly-distributed spray pattern

2.1 SCOPING AND SCREENING METHODOLOGY

Scoping is the initial step in the BSEP License Renewal evaluation methodology. Scoping is performed to identify SSCs that perform intended functions within the scope of License Renewal as required by 10 CFR 54.4. The scoping methodology is described in Subsection 2.1.1.

Screening is the second step of the BSEP methodology and addresses the requirements of an IPA defined in 10 CFR 54.21(a). The BSEP screening process includes (1) a review of the systems and major structures identified as in scope for License Renewal to identify the specific components of those structures and systems that support the functions of 10 CFR 54.4, and (2) a review of the components and structural components to identify those that satisfy the screening criteria of 10 CFR 54.21(a)(1). The screening process identifies those components and structural components that are subject to an aging management review. The screening process is described in Subsection 2.1.2.

In accordance with Appendix A of NUREG-1800, a review of NRC Generic Safety Issues (GSIs) is required to satisfy a finding per 10 CFR 54.29. GSIs that involve issues related to License Renewal aging management reviews or time-limited aging analysis evaluations are to be addressed in the License Renewal Application. The results of this review are included in Subsection 2.1.3.

The NRC staff has identified several issues for which additional regulatory clarification was found necessary; these are referred to as Interim Staff Guidance (ISG) issues. Subsection 2.1.4 discusses the methods used for dealing with applicable ISG issues within the BSEP License Renewal review.

2.1.1 SCOPING

SSCs that satisfy the criteria of 10 CFR 54.4(a)(1), (2), or (3) are within the scope of License Renewal. Specifically, 10 CFR 54.4 states:

> *(a) Plant systems, structures, and components within the scope of this part are—*
>
> (1) *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 that could result in potential offsite exposure comparable to the guidelines in §50.34(a)(1), §50.67(b)(2), or §100.11 of this chapter as applicable.*

(2) *All non-safety related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraphs (a)(1)(i), (ii), or (iii) of this section.*

(3) *All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrated compliance with the Commission's regulation 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 CFR50.62), and station blackout (10 CFR 50.63).*

(b) *The intended functions that these systems, structures, and components must be shown to fulfill in* §54.21 *are those functions that are the bases for including them within the scope of LR as specified in paragraphs (a)(1)-(3) of this section.*

The BSEP scoping process employed a multi-step approach to ensure that systems and structures meeting the criteria of 10 CFR 54.4(a)(1) through (a)(3) were identified. The process was designed to make optimum use of existing plant documents and databases to identify systems and structures in the scope of the Rule. The process relied on the information contained in the PassPort Equipment Database (EDB) to scope the majority of plant systems, structures, and components (SSCs). Subsequently, a series of supplemental evaluations were performed to identify additional components within the scope of License Renewal.

Identification of systems and structures that fall within the scope of the rule at BSEP was performed primarily at the component level, and is consistent with the guidance found in NEI 95-10, Section 3.0. Major structures and plant components such as pumps, valves, tanks, heat exchangers, and instruments at BSEP are assigned unique component numbers that are maintained in the EDB. The EDB also contains a designation of quality class for each component. The process for developing the EDB quality class information is well defined and controlled under a 10 CFR 50, Appendix B quality assurance program.

Reconciling PassPort EDB quality class information against scoping criteria of the Rule provided an efficient tool to perform License Renewal scoping on a component level. These results were then extended to a system/structure level by conservatively taking any system/structure that has one or more components in the scope of License Renewal as being itself within scope. This approach was then augmented by reviews for interactions between non-safety related and safety related components, and Current

License Basis (CLB) reviews for components credited in regulated events. The result is a comprehensive scoping process that bounds the criteria of 10 CFR 54.4 and is consistent with industry and regulatory guidance. (Additional details regarding NRC ISG issues applicable to scoping are provided in Subsection 2.1.4.)

The BSEP Civil/Structural scoping process augmented the scoping process defined above, with considerations of design and functional requirements to ensure all structures within the scope of License Renewal are captured. This review was performed based on design information found in the UFSAR, Design Basis Documents, EDB, Maintenance Rule Database, and License Renewal scoping evaluations. The primary consideration was that any structure housing or providing physical or functional support for components within the scope of License Renewal is itself in the scope of License Renewal. The EDB was used to identify structures which house or support License Renewal components, and associate those structures with the intended functions of the components they contain. This process was used to identify in-scope structures and to derive the associated License Renewal intended function. For example, if a specific structure contains safety related components with an EDB quality classification of “Credited in response to design basis event(s),” the civil intended functions related to supporting and protecting safety related equipment were associated with the structure. Using this methodology, all components and associated EDB quality classifications, within the specific structure, were reviewed and the corresponding civil intended functions assigned to the structure. Those structures for which no License Renewal intended functions were identified are outside the scope of License Renewal.

Details of the scoping process for safety related SSCs, in accordance with 10 CFR 54.4(a)(1), are provided in Subsection 2.1.1.1. Details of the scoping process for non-safety related SSCs whose failure could prevent satisfactory accomplishment of any of the functions identified for safety related SSCs, in accordance with 10 CFR 54.4(a)(2), are provided in Subsection 2.1.1.2. Details of the scoping process for SSCs relied on to demonstrate compliance with one of the regulated events, in accordance with 10 CFR 54.4(a)(3), are provided in Subsection 2.1.1.3.

2.1.1.1 Safety Related Criteria Pursuant to 10 CFR 54.4(a)(1)

10 CFR 54.4(a)(1) pertains to safety related SSCs and states that SSCs within the scope of License Renewal include safety related SSCs 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:

1. The integrity of the reactor coolant pressure boundary;

2. The capability to shut down the reactor and maintain it in a safe shutdown condition; or

3. The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposure comparable to the guidelines in §50.34(a)(1), §50.67(b)(2), or §100.11 of this chapter as applicable.

The PassPort EDB is used to implement the graded quality classification system defined at BSEP. The EDB applies the classification of Quality Class A to structures and components that are necessary, either actively, or passively, to assure the accomplishment of the safety related functions. Items that do not perform a safety related function, but whose failure could prevent the satisfactory accomplishment of a safety related function during or following design basis accidents and transients, should be classified as safety related unless a non-safety related classification has been justified. Component quality classifications documented in the EDB are derived according to plant administrative controls using functions defined in CLB documents, including the UFSAR. A component may perform many functions in support of plant operations that are mentioned in the UFSAR or other CLB references. However, only those functions that meet the definition of safety related result in classifying a component as Quality Class A.

A comparison of the criteria of 10 CFR 54.4(a)(1) with the definition of Quality Class A finds that these criteria are consistent with the exception that the Rule includes references to 10 CFR 50.34(a)(1) (associated with applications for an initial operating license) and 50.67(b)(2) (associated with accident source term limits). At BSEP, 10 CFR 100 guidelines have been applicable historically, under the CLB; and 10 CFR 100.11 has been used to identify components credited with preventing and mitigating off-site exposures. In addition, the NRC has issued a safety evaluation authorizing the use of Alternative Source Terms under 50.67(b)(2) in support of the ongoing BSEP Extended Power Uprate Project. Refer to the letter from NRC (B. Mozafari) to CP&L (J. Keenan), dated May 30, 2002: “Brunswick Steam Electric Plant, Units 1 and 2 - Issuance of Amendment Re: Alternate Source Term.” Consistent with the terms of the Alternate Source Term (AST) license amendment, License Renewal scoping impacts arising from the use of non-safety related equipment to support the use of an AST are evaluated against the criteria of 10 CFR 54.4(a)(2) and are addressed in the following Subsection.

The EDB Quality Class A classification is consistent with the scoping criteria of 10 CFR 54.4(a)(1), such that this designation is sufficient to facilitate scoping of SSCs in accordance with 10 CFR 54.4(a)(1). For the purposes of License Renewal, any system, including support systems, or structure that contains one or more safety related components was considered to be a safety related system or structure.

License Renewal intended functions have been derived for in-scope systems and structures consistent with the scoping approach described above. The primary source of this information is the pertinent component level Quality Class definition. For example, the Residual Heat Removal (RHR) System has one or more components designated as quality classification, “safety related – reactor coolant system pressure boundary;" therefore, the RHR System is assigned the corresponding system intended function "provides Reactor Coolant System pressure boundary." The set of these functions comprises the system/structure intended functions that are the basis for inclusion in License Renewal scope.

Based on the above, the scoping process to identify safety related SSCs for BSEP License Renewal satisfies the criteria in 10 CFR 54.4(a)(1).

2.1.1.2 Non-Safety Related Criteria Pursuant to 10 CFR 54.4(a)(2)

10 CFR 54.4(a)(2) states that SSCs within the scope of License Renewal include non-safety related SSCs whose failure could prevent satisfactory accomplishment of any of the functions identified for safety related SSCs.

Since its implementation of a graded quality classification system in the mid-1980s, BSEP has made extensive use of augmented quality classifications to identify SSCs that have functional or physical interactions with safety related equipment. These augmented quality classifications have been assigned to non-safety related components and documented in PassPort EDB. The EDB quality classification designations have been reconciled with License Renewal scoping criteria to provide a means for scoping of License Renewal components and associated systems/structures. Non-safety related SSCs included in scope by virtue of augmented quality class designations include:

- Selected SSCs credited in transient mitigation, including the Reactor Core Isolation Cooling System
- SSCs associated with hazards and interactions inside Containment, including Reactor Building Closed Cooling Water System piping
- Piping systems associated with flooding and related hazards (Non-safety related Service Water, Demineralized Water, Fire Protection, Condensate, etc.)
- SSCs credited in regulatory correspondence associated with High Energy Line Breaks
- SSCs identified by design documents (engineering evaluations, plant modifications, design basis documents) as potential hazards

Therefore, the EDB quality classifications were used to identify non-safety related components that can be considered a potential source of damage to nearby safety related components.

In addition to scoping on the basis of augmented quality designations, an extensive review was performed to identify additional candidates for inclusion based on the CLB, a review of site and industry operating experience, and other pertinent sources of information. The methodology for this review is as follows:

First, certain non-safety related SSCs were not considered applicable to the review:

1. Consistent with regulatory guidance, consideration of hypothetical failures that could result from system interdependencies that are not part of the plant CLB, or that have not been previously experienced, is not required.

2. In some cases there will be overlap between 10 CFR 54.4(a)(2) and 10 CFR 54.4(a)(3). Evaluations for fires, ATWS, and Station Blackout inherently rely on non-safety related SSCs in order to demonstrate acceptable results. While this equipment would otherwise fall under criterion 10 CFR 54.4(a)(2), it was not specifically identified and addressed as such, because it is already within the scope of License Renewal in accordance with 10 CFR 54.4(a)(3). The same logic also applies to any Environmental Qualification (EQ) Program components that might be non-safety related.

3. The BSEP design and licensing basis includes instances where non-safety related equipment, augmented with a suitable surveillance or monitoring program, is used to maintain safety related equipment or plant conditions within limits consistent with assumed initial conditions of events. For example, plant chemistry is assumed to be within the specifications maintained by the Chemistry Program based upon regular monitoring and analysis. In these instances, it is the monitoring or surveillance program that is primarily credited with ensuring the appropriate initial conditions exist, rather than the reliability of any non-safety related equipment. The function of non-safety related equipment to establish initial conditions for equipment operation or accident assumptions does not constitute the basis for inclusion in the License Renewal scope under 10 CFR 54.4(a)(2).

4. Malfunctions of non-safety related equipment that result in an actuation of safety related equipment do not constitute a basis for inclusion under 10 CFR 54.4(a)(2), since these malfunctions do not result in the loss of a safety related function. For example, loss of a condensate pump might result in a reactor trip and resultant challenge to plant safety systems. However, this would not result in the loss or degradation of any of the associated safety related equipment.

5. With regard to Regulatory Guide 1.97, those components used to monitor Category 1 variables are considered safety related and seismic, and are within the scope of License Renewal under 10 CFR 54.4(a)(1). Those non-safety related components (including sampling systems) that are used to monitor Category 2 and 3 variables are not categorically included on the basis of their monitoring function, since those variables are not relied upon to perform a safety related function, nor would their failure to provide the monitoring function directly result in the failure of safety related SSCs.

Second, after eliminating the above categories of SSCs, the following steps were performed:

1. The BSEP design and licensing basis information was reviewed to identify non-safety related SSCs that function to directly support a safety related system or structure and whose failure could prevent the performance of a required intended function. Sources of this information include Design Basis Documents, the UFSAR, EDB, Maintenance Rule database, and docketed correspondence. The specific function/interaction required of a non-safety related SSC was also identified for each instance where non-safety related SSCs were credited in the CLB. SSCs identified in this category were designated as within the scope of License Renewal per the 10 CFR 54.4(a)(2) criteria, and the associated function or interaction considered to be a system/structure intended function.

2. The BSEP design and licensing basis information was reviewed to identify non-safety related SSC interactions with safety related SSCs that could prevent the performance of a required intended function. Sources of this information include Design Basis Documents, the UFSAR, plant drawings, and other CLB documentation, as well as the EDB, and the Maintenance Rule Database. For each such instance, the specific interaction that may affect the function of safety related SSCs was identified. The SSCs meeting these criteria were designated as within the scope of License Renewal per the 10 CFR 54.4(a)(2) criteria, and the associated interaction considered to be a system/structure-intended function.

3. Current NRC scoping guidance, identified as an ISG issue in Subsection 2.1.4 below, states that "When demonstrating that failures of non-safety related SSCs would not adversely impact on the ability to maintain intended functions, a distinction must be made between non-safety related SSCs that are connected to safety related SSCs and those that are not connected to safety related SSCs. For a non-safety related SSC that is connected to a safety related SSC, the non-safety related SSC should be included within the scope of License Renewal up to the first seismic anchor past the safety/non-safety interface." At BSEP, the majority of "connected piping" can be identified by EDB quality class designation. Where necessary, plant design documents were reviewed or conservative assumptions made to identify additional piping/components in this category. Systems having components credited in this regard were included in the scope of License Renewal. The current licensing basis position for seismic-induced effects between connected non-safety related and safety related piping was provided in response to an NRC comment documented in Amendment 15 of the BSEP FSAR, dated March 1973. The position states that, in cases where safety related piping and non-safety related piping are connected, the analysis of seismic-induced effects was continued well into the non-safety related piping in order to include the effects that non-safety related piping has on the adjoining safety related piping. Generally, this continuation was to a point where the non-safety related pipe was restrained in three directions. If this was not practical,

the non-safety related pipe was analyzed up to a point in the system where it was supported in three directions by three individual supports.

For the purposes of License Renewal scoping, interactions between non-connected SSCs were further broken down into two categories – (1) direct physical interaction, where a non-safety related SSC physically contacts a safety related SSC and impairs its function, and (2) indirect interactions (spray, flooding, etc.), associated with piping degradation and loss of pressure boundary. BSEP UFSAR 3.6.1 states "operating experience has shown that mechanisms do not exist which could cause the instantaneous failure of piping systems without prior detectable leakage." Consistent with this philosophy, the scoping methodology determined that piping in operating systems that has retained its functional integrity will remain supported so long as its supports do not fail. It follows that direct physical interaction with safety related SSCs is prevented by the function of piping supports, and the "preventive option," presented in the NRC ISG, consists of managing aging effects of these supports. Aging effect evaluations associated with direct physical interactions between non-safety related and safety related components are limited to piping/component supports. Civil/structural scoping has included the supports for non-safety related piping/components that have the capability of preventing satisfactory accomplishment of any required safety related functions in spaces where safety related equipment in the scope of License Renewal is present.

Indirect physical interactions between spatially related non-safety and safety related piping/components are not limited to seismic events, but may include other age-related failures of non-safety related SSCs. The scoping process for these indirect interactions is accomplished on the basis of a systematic review of areas and hazards. Plant drawings and documentation were reviewed to identify areas housing safety related SSCs. Pressure retaining component types were identified, since potential spatial interactions (flooding, spray, wetting) were assumed to be related to liquid filled piping systems, and pressure retaining, non-safety related components located in structures housing safety related SSCs were identified on the basis of EDB location information, plant drawings, and other pertinent data. This group of components was further refined to exclude specific components evaluated as not presenting a spatial interaction hazard. Systems having non-safety related components identified as having the potential for adverse spatial interaction with safety related SSCs were included in the scope of License Renewal.

Additional scoping evaluations were performed to make scoping determinations against 10 CFR 54.4(a)(2) that cannot be made on the basis of EDB classification. Notable scoping additions include selected non-safety related connected piping, valves, and components (seismic support), non-safety related piping and supports in the proximity of safety-related SSCs (seismic interaction), Service Water discharge piping (flow path), long term nitrogen supply to Main Steam Safety Relief Valves (flow path), Reactor

Building air receivers (explosion/missile hazard), and Reactor Building leak detection equipment and floor drain systems (flood hazard).

BSEP has implemented the use of Alternative Source Terms (AST) for evaluation of accident consequences in accordance with 10 CFR 50.67. This activity, undertaken in support of the BSEP Extended Power Uprate (EPU) project, makes use of an NRC approved methodology for evaluation of a non-safety related alternate leakage treatment path from the main steam line isolation valves (MSIVs) to the main condenser. NRC letter (B. Mozafari) to CP&L (J. Keenan), dated May 30, 2002: "Brunswick Steam Electric Plant, Units 1 and 2 - Issuance of Amendment Re: Alternate Source Term," identifies the systems, structures and components credited by the AST license amendment application to mitigate the consequences of accidents in accordance with 10 CFR 50.67. Since the BSEP license amendment credits the use of non-safety related SSCs in AST analyses, these have been brought into scope under 10 CFR 54.4(a)(2).

The BSEP methodology for scoping against 10 CFR 54.4(a)(2) combined extensive component level quality data with review of the CLB, operating experience, and other pertinent information, to identify SSCs that have potentially adverse interactions with safety related SSCs. The result is a conservative and comprehensive approach consistent with NRC staff guidance, regarding scoping of 10 CFR 54.4(a)(2). A simplified graphical display of the scoping process is provided in Figure 2.1-1.

Based on the above, the scoping process for BSEP License Renewal identified both non-safety related SSC that support the functioning of safety related SSC (functional interaction) and non-safety related SSC that may have adverse physical interactions with safety related SSC (spatial interaction). Therefore, the process is consistent with and satisfies the criteria in 10 CFR 54.4(a)(2).

2.1.1.3 Other Scoping Pursuant to 10 CFR 54.4(a)(3)

10 CFR 54.4(a)(3) states that SSCs relied upon 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) are within the scope of License Renewal. With the exception of pressurized thermal shock, which is not applicable to BWRs, current licensing basis evaluations have been performed to identify and document the SSCs credited for compliance with of each of these regulations. For these SSCs, the system/structure level intended function is that it is relied upon in safety analyses or evaluations to demonstrate compliance with NRC requirements for the event in question. Systems or structures that have one or more components credited for demonstrating compliance with one of the regulated events are within the scope of License Renewal per the §54.4(a)(3) criteria.

Scoping based on each of the regulated events is described in the following paragraphs.

2.1.1.3.1 Fire Protection

The systems and structures at BSEP that support either fire protection design features or safe shutdown following a postulated fire are within the scope of License Renewal. To determine the SSCs required for fire protection within scope, information in the PassPort EDB and other relevant plant documentation was reviewed. The EDB provides the most comprehensive list of those components providing fire suppression, fire detection, electrical power supply to fire protection equipment, fire barriers/penetration seals, and alternate safe shutdown. Any system with components classified as supporting fire protection in the EDB was considered in scope. Also, any systems, with components credited in plant documents as required to support safe shutdown following a fire were considered in scope.

The steps to identify SSCs relied on for fire protection to meet 10 CFR 54.4(a)(3) are:

1. EDB classification criteria identifying systems required to detect and mitigate fires and to achieve post-fire safe shutdown were reviewed to identify systems credited for compliance with 10 CFR 50.48. In addition, structures that house the components of these systems were identified.

2. The EDB information was supplemented by a review of the Safe Shutdown Analysis Report, the Fire Protection Safe Shutdown and Station Blackout Screening procedure, and the Fire Protection Program Manual. The review of documentation included the sources cited by the proposed NRC staff ISG letter for fire protection scoping, and additional information regarding the ISG is provided in Subsection 2.1.4 below.

3. Based on the above, License Renewal intended functions relative to the criteria of 10 CFR 54.4(a)(3) for fire protection were applied to each system and structure determined to meet this criteria.

The scoping process to identify systems and structures relied upon and/or specifically committed to for fire protection for BSEP is consistent with and satisfies the criteria in 10 CFR 54.4(a)(3).

2.1.1.3.2 Environmental Qualification

10 CFR 50.49(b) defines electric equipment important to safety that is required to be environmentally qualified to mitigate certain accidents that result in harsh environmental conditions in the plant. An EQ Master List of Equipment (EQML) has been developed in accordance with the requirements of 10 CFR 50.49(b) based on 1) a review of the BSEP design basis accidents, 2) the resulting environmental service conditions, 3) the

functional requirements of the systems, 4) the functional requirements of individual components required to isolate the break or mitigate or monitor the effects of the accident, and 5) the physical location of the components. This list is maintained within the EDB, and contains all of the equipment within the scope of the BSEP EQ Program.

The steps to identify SSCs relied on for environmental qualification to meet 10 CFR 54.4(a)(3) are:

1. The EDB identifies components that are on the BSEP EQML in accordance with 10 CFR 50.49. The EDB was used as a principal input document for scoping of SSCs. Any system that contained one or more components designated as EQ-related in EDB was considered in scope due to EQ. Also, structures that house the components of the EQML were identified.

2. The standard intended function for EQ was applied to the affected systems: "Credited with Compliance with Environmental Qualification Regulations."

The scoping process to identify systems and structures relied upon and/or specifically committed to for environmental qualification for BSEP is consistent with and satisfies the criteria in 10 CFR 54.4(a)(3). Note that EQ components may meet the requirements for Time-Limited Aging Analyses (TLAAs). EQ-related TLAAs are discussed in Section 4.4.

2.1.1.3.3 Anticipated Transients Without Scram

BSEP design features related to Anticipated Transients Without Scram (ATWS) are within the scope of License Renewal because they are relied on to meet the requirements of 10 CFR 50.62. ATWS mitigation as defined by 10 CFR 50.62 is accomplished by the use of three systems at BSEP: 1) the Alternate Rod Injection (ARI) System, 2) the Standby Liquid Control (SLC) System, and 3) the ATWS-Recirculation Pump Trip (ATWS-RPT) System.

The steps to identify systems and structures at BSEP relied upon for ATWS mitigation to meet the requirements of 10 CFR 54.4(a)(3) are outlined below:

1. A review was performed to identify the SSCs credited with mitigating a postulated ATWS event. The systems that interface with and the structures that house ARI, SLCS and ATWS-RPT components were the focus of the review.

2. Based on the above, the License Renewal intended function relative to the criteria of 10 CFR 54.4(a)(3) for ATWS events was identified for each system and structure determined to meet this criteria.

The scoping process to identify systems and structures relied upon and/or specifically committed to for a postulated ATWS event for BSEP is consistent with and satisfies the criteria in 10 CFR 54.4(a)(3).

2.1.1.3.4 Station Blackout

EDB quality classifications that have been assigned to components credited with compliance with Station Blackout requirements were used to identify the applicable equipment. To augment the EDB-identified components, additional reviews of the Station Blackout Coping Analysis Report and other plant documents and procedures were performed.

The steps to identify systems and structures at BSEP relied upon for SBO to meet the requirements of 10 CFR 54.4(a)(3) are outlined below:

1. The EDB, Station Blackout Coping Analysis Report, SBO Program Document, plant procedures, and NRC ISG regarding additional equipment required to recover from SBO were reviewed to determine the scope of system and structures required for SBO. The NRC staff ISG regarding SBO scoping is discussed further in Subsection 2.1.4 below.

2. Based on the above, License Renewal intended function relative to the criteria of 10 CFR 54.4(a)(3) for a postulated SBO was identified for each system and structure determined to meet this criteria.

The scoping process to identify systems and structures relied upon and/or specifically committed to for a postulated SBO for BSEP is consistent with and satisfies the criteria in 10 CFR 54.4(a)(3).

2.1.2 STRUCTURE AND COMPONENT SCREENING

This subsection describes the process used at BSEP to identify the in-scope structures and components (SCs) that require an aging management review and justifies the process with respect to requirements of an Integrated Plant Assessment (IPA) defined in 10 CFR 54.21(a). In the BSEP IPA, the process of identifying SCs subject to AMR is referred to as screening.

The requirement to identify SCs subject to an aging management review is specified in 10 CFR 54.21(a)(1) that states:

> *Each application must contain the following information:*
>
> *(a) An integrated plant assessment (IPA). The IPA must—*

(1) For those systems, structures, and components within the scope of this part, as delineated in Sec. 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 Sec. 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.

The screening process was performed by discipline: mechanical, civil/structural, and electrical/I&C. The screening process for mechanical components is described in Subsection 2.1.2.1; for civil structures, in Subsection 2.1.2.2; and for electrical and I&C systems, in Subsection 2.1.2.3.

During the screening process, some SCs were incorporated into commodity groups based on similarity of their design or materials of construction. Use of commodity groups made it possible to address an entire group of SCs with a single evaluation.

2.1.2.1 Mechanical Components

The following steps describe the process used to identify mechanical components subject to aging management review. The process is called “screening” and was implemented at BSEP as follows:

- Mechanical components and commodities within systems credited with intended functions were identified.

- Components and commodities which perform mechanical component intended functions were identified.

- Components determined to be not subject to an AMR were screened out. These include components that are:
  (a) Active,
  (b) Short lived or replaced based on qualified life or specific time period,
  (c) Not credited with performance of a mechanical intended function.

- Where possible, plant components/commodities were assigned to groups that coincided with NUREG-1801 component/commodity groups in order to facilitate alignment of components with NUREG-1801, including cases where BSEP has only a subset of the equipment types listed in NUREG-1801. For example, the NUREG-1801 commodity “Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC)” was used even though BSEP does not have HPCS pumps. In some cases, this resulted in similar entries in mechanical system tables for components/commodities to accommodate similar groups of equipment that did not comport to the NUREG group. As an example, a system may include “Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC),” that included RHR pump casings, and another group entitled “Pumps” that included pump casings that did not correspond to the NUREG-1801 commodity.

The typical sequence of screening steps performed is as follows:

1. System intended function boundaries were established, and mechanical components subject to screening were identified. For the systems in-scope for License Renewal, the system intended function boundaries for BSEP were delineated at a component level using a combination of EDB tag numbers and system level commodities for those in-scope components that are not discretely identified in EDB. The resulting list of components and commodities required for successful completion of a system intended function constitute a functional evaluation boundary for License Renewal. The aggregate of these components and commodities constitutes the complete list of in-scope mechanical components subject to screening. Additionally, License Renewal Boundary Drawings were developed for selected BSEP systems in the scope of License Renewal. The drawings are based on BSEP Piping and Instrumentation Drawings (P&IDs). The primary purpose of these drawings is to graphically depict system function evaluation boundaries and the components within scope of License Renewal. These boundary drawings were also used during the screening process for purposes such as identification of untagged commodities within evaluation boundaries. The system functional boundaries on the License Renewal Boundary Drawings were expanded to highlight piping components included in scope as seismic continuity piping or components with potential spatial interactions in accordance with 10 CFR 54.4(a)(2). The License Renewal Boundary Drawings associated with systems within the scope of License

Renewal are identified in the mechanical screening results described in Section 2.3.

2. Mechanical components were subjected to screening based on active/passive function. EDB uses an “equipment type“ designation to catalog components into basic equipment categories. These equipment codes are comparable to the component types presented in NEI 95-10, Appendix B, and provide a means to readily sort many components as to engineering discipline, active/passive determination and recommended intended function. Using NEI 95-10, Appendix B, as a guide, EDB equipment types were used to screen components as having an active or passive role when performing intended functions. Components having equipment types designated as active were not subject to AMR and were categorically screened out on this basis. Components having equipment types that are indeterminate were reviewed individually to ascertain if they are active and thereby excluded from aging management review requirements.

3. Mechanical components were reviewed to determine if they constituted a complex assembly. 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/monitoring of the assembly is sufficient to identify degradation of these components. Examples of complex assemblies include diesel generators and refrigeration units. Complex assemblies, per se, are considered active and can be excluded from the scope of License Renewal. However, to the extent that complex assemblies include piping or components that interface with external equipment, or components that cannot be adequately tested/monitored as part of the complex assembly, those components must be subject to screening. For BSEP, the evaluation of complex assemblies was done as part of the component AMR.

4. Mechanical components were reviewed to determine if they were subject to periodic replacement. Those mechanical component types subject to replacement based on a qualified life or specified time period (i.e., are not long-lived components) were screened as not subject to AMR. Replacement programs may be based on vendor recommendations, plant experience, or any means that establishes a specific replacement frequency under a controlled program. A qualified life or specified replacement period does not necessarily have to be based on calendar time. Run time and operational cycles are examples of parameters that may be used to define qualified life or replacement frequency, but are not based on calendar time.

5. Mechanical components may be categorically excluded by the License Renewal Rule. 10 CFR 54.21(a)(1)(i) provides a summary of specific component types excluded from the scope of the IPA. These components are addressed within NEI 95-10, Appendix B, and were excluded.

6. Consumable items were evaluated. Consumable parts of a component may be passive, long-lived, and necessary to fulfill an intended function. In accordance with NRC screening guidance of NUREG-1800, Table 2.1-3, consumables may be divided into four basic categories for the purpose of License Renewal: (a) packing, gaskets, component seals, and O-rings; (b) structural sealants; (c) oil, grease, and component filters; and (d) system filters, fire extinguishers, fire hoses, and air packs. Screening of consumables was either done as part of the component aging management review or the item was excluded based on NRC screening guidance.

7. Component intended functions were identified. Each component subject to aging management review was evaluated to determine the component level mechanical function(s) performed without moving parts or change in configuration, in fulfilling or supporting system intended functions. These are considered to be mechanical component intended functions. Mechanical component intended functions are listed on Table 2.0-1. In a limited number of cases, there are in-scope mechanical components that do not support a mechanical system intended function but are in scope because of their potential to damage safety related components through direct impact during a seismic event. These components do not support a mechanical intended function but remain in-scope because of their EDB classification. In-scope mechanical components with no mechanical intended function are assigned a screening result of “no mechanical intended function.”

2.1.2.2 Civil Structures

The screening process was performed on each structure identified to be within the scope of License Renewal. This method evaluated the individual SCs included on or within in-scope structures to identify specific SCs or SC groups that require an aging management review.

The sequence of steps performed on each structure determined to be within the scope of License Renewal was as follows:

1. A bulk screening process was employed. Bulk screening is the process by which typical components are grouped together and screened as a single commodity. Implementation of a bulk screening process requires components be grouped by similarity of both construction and function. The source of the civil commodities list was a combination of those civil components identified by tag number in the PassPort EDB and those un-tagged civil components identified through industry experience and review of the plant CLB. An active/passive determination was performed based on whether the commodity supports its intended function without moving parts or without a change in configuration or properties. A determination of commodity replacement based on a qualified life or specified

time period was performed for each commodity type. Finally, a set of potential intended functions were developed for each commodity group.

2. Civil screening was performed on a structural system basis, and only civil commodities located within the specific structural system being screened were addressed. The identification of civil commodities for a specific structure was performed using EDB location data, design drawings, general arrangement drawings, penetration drawings, plant modifications, the UFSAR, Design Basis Documents, system descriptions, and plant walkdowns.

   EDB equipment types within a specific structure were reviewed and civil commodities were assigned to the structure based on that review. For example, if the EDB equipment type “MCC” (motor control center) was identified in a specific structure; and its quality classification was determined to support a License Renewal intended function, civil commodities would be assigned to the structure as follows:

   - Electrical Enclosure – (MCCs are electrical enclosures; therefore, the civil commodity “Electrical Enclosure” is added to the structure.)
   - Equipment Support – (Since MCCs are considered equipment and equipment must be supported, the civil commodity of “Equipment Support” is added to the structure.)
   - Anchorage Embedment” - (Because all supports must be anchored to the structure, the civil commodity “Anchorage Embedment” is included within the structure.)
   - Cable Tray and Conduit – (Because electrical components require cables, and cables are routed in trays and conduits, the civil commodity of “Cable Tray and Conduit” is added to the structure.)
   - Electrical Support – (Since cable tray and conduit are considered electrical components and they require support, the civil commodity “Electrical Support” is added to the structure.)

   Evaluation boundaries between mechanical components, electrical components, and structures and structural components were coordinated between the discipline reviewers. This same methodology was used with components identified by means other than EDB, such as: a UFSAR discussion of a specific component or design feature, an un-tagged component identified on a plant drawing, or a component observed during a plant walkdown.

3. The commodity specific intended functions were developed based on comparison of the potential intended functions from the generic commodity

groups to the specific intended functions of the structure and the EDB component quality classification. The screening process reviewed EDB equipment types, design drawings, general arrangement drawings, plant modifications, the UFSAR, Design Basis Documents, system descriptions, and plant walkdown results within each structure and developed a list of commodities within that structure requiring aging management review. The component intended functions are listed on Table 2.0-1. Those SCs that have a component or commodity intended function that supports a structure intended function are subject to an aging management review.

2.1.2.3 Electrical and I&C Systems

The method used to determine which electrical and I&C components were subject to an aging management review was based on the component commodity group approach consistent with the guidance of NEI 95-10.

The sequence of steps used for identification of electrical and I&C components that require an aging management review is as follows:

1. Using the EDB, the electrical equipment and component types within the systems and structures determined to be in scope for License Renewal were identified. This step developed a comprehensive list of EDB electrical component types present in the in-scope electrical systems.

2. Using the UFSAR, plant design drawings, and other documentation, the equipment and component types within the electrical and I&C systems determined to be in scope for License Renewal in addition to those identified in step 1 were identified. This step developed a comprehensive list of electrical component types present in the in-scope systems and structures.

3. The component types associated with the electrical and I&C systems within the scope of License Renewal were organized into commodity groupings, e.g., circuit breakers, cables, and sensors. In general, grouping of component types used the guidance in NEI 95-10 regarding grouping of components based on similar functions.

4. The electrical and I&C component commodity groups that perform an intended function without moving parts or without a change in configuration or properties, i.e., the screening criterion of 10 CFR 54.21(a)(1)(i), were identified. Commodity groups that have passive functions may be subject to an aging management review and were identified by this step.

5. For the passive electrical and I&C component commodity groups, component commodity groups that are not subject to replacement based on a qualified life or specified time period, i.e., the screening criterion of 10 CFR 54.21(a)(1)(ii), were

identified as requiring an aging management review. Commodity group components that are replaced based on qualified life or specified time period (i.e., short-lived components) are not subject to aging management review. In addition, commodity group components that are replaced based on routine testing may not be subject to aging management review, on condition that plant-specific justification is provided to document that the testing is capable of detecting aging-related component degradation, not just component failure.

Electrical and I&C components that are screened in accordance with Steps 1 through 5 and meet the requirements of 10 CFR 54.21(a)(1)(i) and (ii) are subject to aging management review.

2.1.3 GENERIC SAFETY ISSUES

In accordance with the guidance in NEI 95-10 and Appendix A.3 of NUREG-1800, "Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants," review of NRC Generic Safety Issues (GSIs) as part of the License Renewal process is required to satisfy a finding per 10 CFR 54.29. As a result of the review of NUREG-0933, Supplement 27, dated June 2003, and previous License Renewal applications, the following GSIs have been evaluated for License Renewal:

1. GSI-168, Environmental Qualification of Electrical Equipment – This GSI relates to aging of electrical equipment that is subject to the qualification requirements of 10 CFR 50.49. In accordance with NRC Regulatory Issue Summary (RIS) 2003-09, "Environmental Qualification of Low-Voltage Instrumentation and Control Cables," GSI-168 has been resolved. Consistent with the guidance provided in RIS 2003-09, no additional information is required to address GSI-168. The processes used to extend the qualified life for License Renewal are addressed as a TLAA in Subsection 4.4.1.

2. GSI-190, Fatigue Evaluation of Metal Components for 60-year Plant Life – This GSI addresses fatigue life of metal components and was closed by the NRC. However, the NRC concluded that License Renewal applicants should address the effects of reactor coolant environment on component fatigue life. Accordingly, the issue of environmental effects on component fatigue life is addressed in Subsection 4.3.3.

2.1.4 INTERIM STAFF GUIDANCE ISSUES

The NRC staff has published additional regulatory guidance for several License Renewal technical issues, referred to as Interim Staff Guidance (ISG) issues. The following ISG issues have been identified:

ISG-1	GALL Report as One Acceptable Way to Manage Aging Effects
ISG-2	Station Blackout (SBO) Scoping
ISG-3	Concrete Aging Management Program
ISG-4	Fire Protection Systems
ISG-5	Identification and Treatment of Electrical Fuse Holder
ISG-6	Identification and Treatment of Housing for Active Components
ISG-7	Scoping Guidance for Fire Protection Systems, Structures, and Components
ISG-8	Updating the Improved Guidance Document Process
ISG-9	Scoping Criteria for 10 CFR 54.4(a)(2)
ISG-10	Standard License Renewal Application Format
ISG-11	Aging Management of Environmental Fatigue for Carbon/Low-alloy Steel
ISG-12	Operating Experience with Cracking of Class 1 Small-Bore Piping
ISG-13	Management of Loss of Preload on Reactor Vessel Internals Bolting Using the Loose Parts Monitoring System
ISG-14	Operating Experience with Cracking in Bolting
ISG-15	Revision to Generic Aging Lessons Learned (GALL) Aging Management Program XI.E2
ISG-16	Time-Limited Aging Analyses (TLAA) Supporting Information for License Renewal Applications
ISG-17	Bus Ducts (Iso-Phase and Non-Segregated) for Electrical Bus Bar
ISG-18	Revision to GALL Aging Management Program XI.E3 for Inaccessible Cable (Medium Voltage)
ISG-19	Revision to GALL Aging Management Program XI.M11, Nickel-Alloy Nozzles and Penetrations
ISG-20	Revision to GALL Aging Management Program XI.M19, Steam Generator Tube Integrity

Each of the ISG issues is discussed below:

2.1.4.1 ISG-1 GALL Report as One Acceptable Way to Manage Aging Effects

Aging management review results have been compared to the GALL Report (NUREG-1801) in Chapter 3.

2.1.4.2 ISG-2 Station Blackout (SBO) Scoping

NRC staff guidance has been issued to clarify that the SSCs relied on for recovery from a Station Blackout (SBO), in addition to SSCs relied on for coping with an SBO, should be in scope for License Renewal. The NRC staff position is that the plant system portion of the offsite power system should be included in scope. For BSEP, including SBO recovery equipment brings into scope various electrical components and associated structures associated with providing offsite power via the switchyard to plant electrical buses. The following specific systems support recovery from an SBO event and have been included in the scope of License Renewal in accordance with ISG-2.

1. 230KV Switchyard System (includes the Main Power Transformers)
2. Startup Auxiliary Transformers and Unit Auxiliary Transformers
3. Generator Iso-phase Bus System
4. Switchyard Relay Building
5. Structural components/commodities that support the above systems.

The preferred source of offsite power is via the Startup Auxiliary Transformer (SAT). The SAT is fed from the 230KV Switchyard, which has multiple sources of supply from the 230KV transmission and distribution system. It should be noted that the BSEP Unit 1 and Unit 2 230KV Switchyards are electrically independent of each other and have no crosstie capabilities. The scoping boundary for the preferred source of offsite power are the motor operated disconnects (MODs) for Unit 1, M11 and M12 (M15 and M16 for Unit 2).

The alternate (delayed) source of offsite power when recovering from an SBO event is obtained by backfeeding through the Main Transformers from the 230KV Switchyard to the Unit Auxiliary Transformer (UAT). It should be noted that prior to backfeeding the Main Transformers, the no-load disconnect switch to the Main Generator must be opened. The 230KV power circuit breakers (PCBs) represent the scoping boundary for the alternate source of offsite power. The PCB boundary pairs for Unit 1 are M05 and M06 (M21 and M22 for Unit 2). Refer to Figure 2.1-2 for a simplified system diagram showing these power paths.

The passive, long-lived electrical components comprising the restoration power path for offsite power that are subject to an aging management review are as follows:

- Generator Isolated Phase (Iso-Phase) Bus Duct
- Non-Segregated 4.16KV & 480V Bus Duct
- High-Voltage Insulators
- Switchyard Bus
- Insulated cables and connections
- Transmission conductors and connections

2.1.4.3 ISG-3 Concrete Aging Management Program

The NRC ISG for aging management of concrete elements determined that accessible concrete structures that are in the scope of License Renewal will be subject to visual inspection to detect postulated aging effects. Inspections will be done periodically in accordance with ASME Code, Section XI, Subsection IWL, for accessible portions of the primary containment as an aging management program requirement during the period of extended operation. Accessible portions of other structures in scope for License

Renewal will receive a similar inspection in accordance with the Structures Monitoring Program. Below grade (inaccessible) concrete structures and components when exposed by excavation will be inspected in accordance with the applicable aging management program.

2.1.4.4 ISG-4 Fire Protection Systems

NRC staff positions on aging management of fire protection (FP) systems deal with four areas:

- Operational activities for Halon/Carbon Dioxide Fire Suppression Systems
- Wall Thinning of FP Piping Due to Internal Corrosion
- Quantitative Surveillance Guidelines
- Testing of Sprinkler Heads

The NRC staff determined that operational requirements for the halon/carbon dioxide systems had no aging management attributes and, therefore, eliminated them as aging management requirements. Revision of the FP piping portion of the program permits non-intrusive testing and analysis in lieu of intrusive system monitoring that could have resulted in adverse consequences for the equipment. Revision of the surveillance guidelines (frequency, sample size, etc.) and sprinkler head testing incorporated consideration of NFPA inspection standards and allowed for plant-specific testing if justified. With the exception of the requirements for the halon/carbon dioxide systems, these areas are addressed in the fire protection and fire protection water system programs. These aging management programs have been evaluated using the program attributes from NUREG-1801 as modified by ISG-04. Refer to Appendix B subsections B.2.10, Fire Protection Program and B.2.11, Fire Water System Program.

2.1.4.5 ISG-5 Identification and Treatment of Electrical Fuse Holder

The NRC ISG for screening of fuse holders determined that fuse holders that are not part of an active component or assembly, such as, switchgear, power supplies, power inverters, battery chargers, and circuit boards, are considered to be passive electrical components and, therefore, require an aging management review. Such fuse holders are evaluated for License Renewal in the same manner as terminal blocks and other types of electrical connections. The NRC ISG also determined that fuse holders that are piece parts of an active assembly are not subject to aging management review, because they would be subject to periodic inspection and maintenance in accordance with the maintenance and surveillance activities applicable to the active assembly.

Using the criteria of ISG-5, a review of fuse holders was performed. As a result of the review, it was determined that applicable fuse holders were part of an active component or assembly. Therefore, no fuse holders require an aging management review in accordance with the criteria defined in ISG-5.

2.1.4.6 ISG-6 Identification and Treatment of Housing for Active Components

The guidance of ISG-6 has been used in the screening process discussed in Subsection 2.1.2.1. The screening process specified that the passive function of housings of active equipment, such as dampers and fans, should be included within the scope of License Renewal.

2.1.4.7 ISG-7 Scoping Guidance for Fire Protection Systems, Structures, and Components

During NRC scoping and screening inspections for License Renewal, issues regarding the scoping and screening of fire protection equipment have arisen. Therefore, the NRC staff has provided additional guidance in this area by noting that fire protection requirements implemented in accordance with 10 CFR 50.48 may extend beyond those providing protection to safety related equipment. The Proposed Staff Guidance on the Scoping of Fire Protection Equipment for License Renewal provides clarification of fire protection scoping requirements and proposes revisions to License Renewal guidance documents. The proposed guidance was issued because (as stated in the ISG letter) "[d]uring previous NRC scoping and screening inspections for License Renewal, issues regarding the scoping and screening of fire protection equipment have arisen, indicating that additional guidance would be useful." The ISG suggests sources that may be used to determine the SSCs within the scope of fire protection for License Renewal such as the operating license, license conditions, NRC safety evaluation reports, UFSAR descriptions, various regulatory documents, docketed correspondence, etc. It further clarifies that a simple description, or "mere mention," of an SSC within the CLB does not necessarily constitute a "commitment" or imply that the component is required for compliance to 10 CFR 50.48, but that such SSCs may sometimes be excluded from FP scope provided the licensing basis does not rely upon such SSCs for compliance with 10 CFR 50.48.

The review performed to identify the BSEP fire protection scope for License Renewal was comprehensive and has been determined to include all those sources cited by the proposed guidance letter. During this review some fire protection related SSCs were identified which are either discussed briefly for completeness in the CLB, or are prominent features which merit discussion of their functional purpose, but which are determined to not be within the scope of 10 CFR 50.48. Since questions have arisen concerning the exclusion of certain systems from the fire protection program, specifically the Drywell, switchyard, main building drains, and yard hydrants, clarification of status of these systems is discussed as follows:

1. Drywell: Section O of Appendix R to 10 CFR 50 requires a reactor coolant pump oil collection system, with attendant fire prevention/protection features, if "the containment is not inerted during normal operation." Since the BSEP Drywells are inerted and the inert state precludes the existence of any other fire hazards

within them; a reactor coolant pump oil collection system and permanent fire protection features within the Drywell are not required.

2. Switchyard: Other than being required to facilitate recovery from the Station Blackout (SBO) event, switchyard equipment is not credited with any intended function for License Renewal. Furthermore, it is not considered credible that the station would require concurrent recovery from both SBO and fire events. This is further amplified by NRC scoping guidance in the Statements of Consideration for 10 CFR Part 54 (60FR22467) dated May 8, 1995, which states that "… an applicant need not consider hypothetical failures or second-, third-, or fourth-level support systems in determining the SSCs within the scope of the rule required by the applicable Commission regulations." Based on this guidance, there is no requirement to extend fire protection scoping to components included in scope solely on the basis of SBO compliance. It is therefore determined that the switchyard is not subject to the requirements of 10 CFR 50.48.

3. Main Building Drains: Section D.1 (i) of Appendix A of BTP APCSB 9.5-1 allows for the exclusion of floor drains in operating plants where the accumulation of fire fighting water does not create unacceptable consequences. BSEP UFSAR Section 9.5.1 describes how the large openings between elevations, and the large capacity of the lowest elevations within the reactor, diesel generator and service water buildings, preclude the potential for damage from the accumulation of water due to fire fighting activities. Potential flooding from the activation of portions of the fire suppression system installed after the initial submittal of the FP Program, such as those installed in the cable spreading, RHR, and Core Spray rooms, has also been determined by analyses to result in no unacceptable consequences. The floor drains within these buildings (other than those within the diesel fuel oil storage cells which have been modified to preclude the possibility of flame propagation) are therefore excluded from the requirements of 10 CFR 50.48.

4. Yard Hydrants: Dry barrel hydrants are installed on the underground main loop at approximate 250-foot intervals throughout the site as described in UFSAR Section 9.5.1. This represents good operating practice and is consistent with the requirements for yard main system installations as presented in BTP APCSB 9.5-1, Appendix A. However, there are no exterior fire zones listed in the BSEP FHA, and no fire within a listed zone is postulated to require the use of exterior hydrants for suppression; therefore, the yard hydrants are not subject to the requirements of 10 CFR 50.48.

2.1.4.8 ISG-8 Updating the Improved Guidance Document ISG Process

ISG-8 is a non-technical issue requiring no action.

2.1.4.9 ISG-9 Scoping Criteria for 10 CFR 54.4(a)(2)

The NRC staff reiterated the guidance provided in the Statements of Consideration for 10 CFR Part 54 (the Rule) regarding scoping of non-safety related SSCs whose failure could prevent satisfactory accomplishment of any safety related functions of SSCs identified in paragraphs 10 CFR 54.4(a)(1)(i), (ii) or (iii). The guidance stated that the evaluation to determine which non-safety related SSCs are within scope should not consider hypothetical failures, but should, based on engineering judgment and operating experience, consider the likelihood of system failure during the extended period of operation. The guidance provided in the March 15, 2002 NRC letter applicable to SSCs meeting 10 CFR 54.4(a)(2) supplements the guidance provided in the December 3, 2001 NRC letter regarding seismic II/I piping systems.

The methodology used for scoping of BSEP SSCs in accordance with 10 CFR 54.4(a)(2) is described in Subsection 2.1.1.2. The approach is consistent with ISG-9 for scoping pursuant 10 CFR 54.4(a)(2).

2.1.4.10 ISG-10 Standard License Renewal Application Format

The NEI Standard Format for License Renewal Applications was used in the preparation of this application.

2.1.4.11 ISG-11 Aging Management of Environmental Fatigue for Carbon/Low-alloy Steel

Aging management of environmental effects on metal fatigue is addressed in Subsection 4.3.3.

2.1.4.12 ISG-12 Operating Experience with Cracking of Class 1 Small-Bore Piping

Aging management activities associated with cracking of small-bore Class 1 piping are discussed in Subsection 3.1.2.2.4.1.

2.1.4.13 ISG-13 Management of Loss of Preload on Reactor Vessel Internals Bolting Using the Loose Parts Monitoring System

The NRC staff has promulgated no guidance regarding this ISG.

2.1.4.14 ISG-14 Operating Experience with Cracking in Bolting

The NRC staff has promulgated no guidance regarding this ISG.

2.1.4.15 ISG-15 Revision to Generic Aging Lessons Learned (GALL) Aging Management Program XI.E2

The program for aging management of electrical cables not subject to 10 CFR 50.49 used in instrument circuits is discussed in Appendix B, Subsection B.2.25.

2.1.4.16 ISG-16 Time-Limited Aging Analyses (TLAA) Supporting Information for LR Applications

ISG-16 was considered in the development of TLAA information in Chapter 4.0.

2.1.4.17 ISG-17 Bus Ducts (Iso-Phase and Non-Segregated) for Electrical Bus Bar

The aging management program for bus ducts is provided in Appendix B, Subsection B.2.31, Phase Bus Aging Management Program.

2.1.4.18 ISG-18 Revision to GALL Aging Management Program XI.E3 for Inaccessible Cable (Medium Voltage)

Aging management of inaccessible medium voltage cables is addressed in Appendix B, Subsection B.2.27, Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.

2.1.4.19 ISG-19 Revision to GALL Aging Management Program XI.M11, Nickel-Alloy Nozzles and Penetrations

This ISG is not applicable to BSEP; BSEP does not use this aging management program.

2.1.4.20 ISG-20 Revision to GALL Aging Management Program XI.M19, Steam Generator Tube Integrity

This ISG is not applicable to BSEP; BSEP does not use steam generators.

2.1.5 CONCLUSIONS

The methods described in Subsections 2.1.1 through 2.1.3, and portions of Subsection 2.1.4 dealing with scoping and screening, were used to identify the systems, structures, and components that are within the scope of License Renewal and require an aging management review. The methods are consistent with, and satisfy the requirements of, 10 CFR 54.4 and 10CFR 54.21(a)(1).

FIGURE 2.1-1 SCOPING PROCESS FOR 10 CFR 54.4(a)(2) COMPONENTS

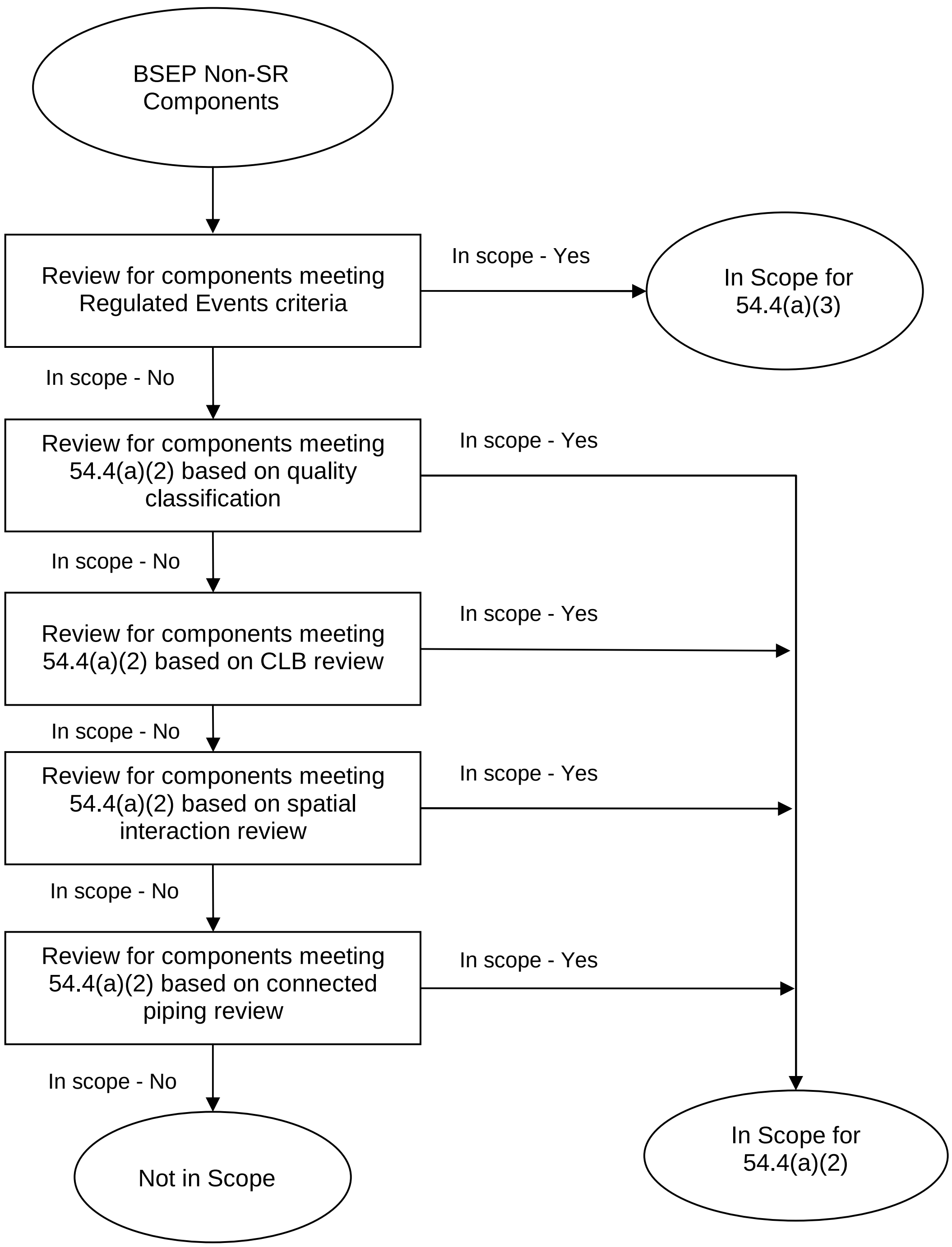
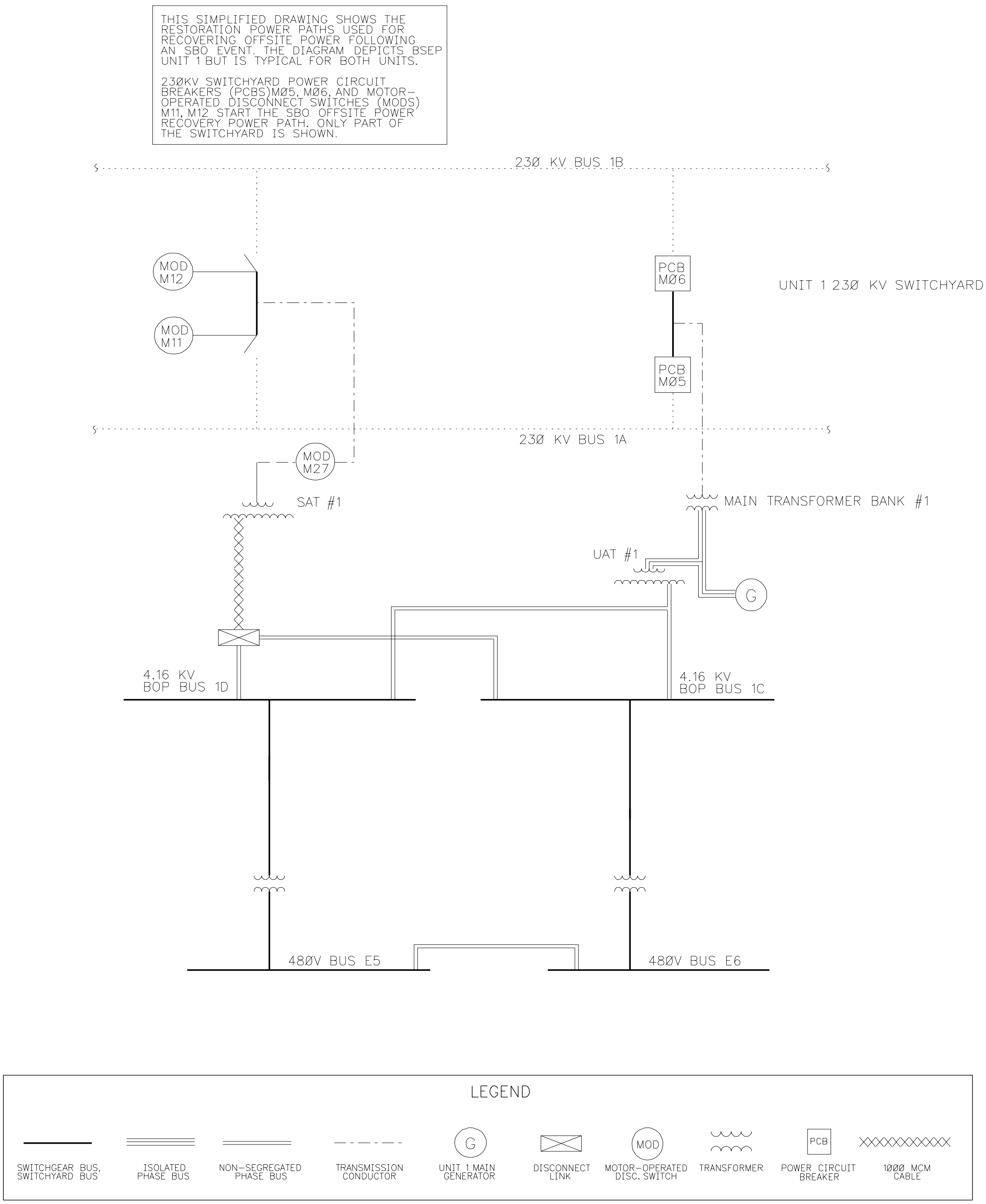


FIGURE 2.1-2 POWER PATH FOR RECOVERY OF OFFSITE POWER AT BSEP FOLLOWING A STATION BLACKOUT EVENT



2.2 PLANT LEVEL SCOPING RESULTS

The BSEP License Renewal review methodology consists of three distinct processes: scoping, screening, and aging management reviews. This section provides the results of application of the scoping process described in Section 2.1.1.

Tables 2.2-1, 2.2-2, and 2.2-3 provide the results of applying the License Renewal scoping criteria to mechanical systems, structures, and electrical/I&C systems. If a system or structure, in whole or in part, meets one or more of the License Renewal scoping criteria, the system or structure is considered to be within the scope of License Renewal. Also, included in the tables are references to the sections in the application that discuss screening results for in-scope systems and structures.

Figure 2.2-1 provides a layout view of BSEP and identifies the major in-scope plant structures.

TABLE 2.2-1 LICENSE RENEWAL SCOPING RESULTS FOR MECHANICAL SYSTEMS

System Name	System in License Renewal Scope	Screening Results Application Subsection
Reactor Vessel and Internals	Yes	2.3.1.1
Neutron Monitoring System	Yes	2.3.1.2
Reactor Manual Control System	Yes	2.3.1.3
Control Rod Drive Hydraulic System	Yes	2.3.1.4
Reactor Protection System	Yes	2.3.2.10
Reactor Water Cleanup System (RWCU)	Yes	2.3.3.1
Reactor Coolant Recirculation System	Yes	2.3.1.5
Core Spay System (CS)	Yes	2.3.2.6
Standby Liquid Control System (SLC)	Yes	2.3.2.8
Residual Heat Removal System	Yes	2.3.2.1
Automatic Depressurization System	Yes	2.3.2.5
Containment Atmospheric Control System	Yes	2.3.2.3
High Pressure Coolant Injection System (HPCI)	Yes	2.3.2.4
Reactor Core Isolation Coolant System (RCIC)	Yes	2.3.3.2
Reactor Building Sampling System	Yes	2.3.3.3
Post-Accident Sampling System	Yes	2.3.3.4
Torus Drain System	Yes	2.3.3.32
Main Steam System	Yes	2.3.4.1
Extraction Steam System	Yes	2.3.4.2
Moisture Separator Reheater Drains System and Reheat Steam System	Yes	2.3.4.3
Auxiliary Boiler (includes Steam)	Yes	2.3.4.4
Feedwater System (includes Feedwater Heaters)	Yes	2.3.4.5
Heater Drains, and Miscellaneous Vents and Drains	Yes	2.3.4.6
Condensate System	Yes	2.3.4.7
Condensate Filter Demineralizer	Yes	2.3.4.7
Condensate Deep Bed Demineralizer, and Condensate Out Demineralizer	Yes	2.3.4.7
Condensate Makeup System, including Makeup Water Treatment (MWT)	Yes	2.3.4.7
Turbine Building Sampling System	Yes	2.3.4.8
Condenser	Yes	2.3.4.7
Condenser Water Box Air Removal, Condenser Vacuum system (Off-Gas)	Yes	2.3.4.9
Circulating Water System	Yes	2.3.3.5
Screen Wash Water System	Yes	2.3.3.6
Service Water System	Yes	2.3.3.7
Reactor Building Closed Cooling Water System	Yes	2.3.3.8

TABLE 2.2-1 (continued) LICENSE RENEWAL SCOPING RESULTS FOR MECHANICAL SYSTEMS

System Name	System in License Renewal Scope	Screening Results Application Subsection
Turbine Building Closed Cooling Water System	Yes	2.3.3.9
Turbine System	No	
Turbine Electro-Hydraulic Control System	Yes	2.3.4.10
Turbine Generator Lube Oil System	Yes	2.3.4.11
Gland Seal System, and Steam Seal System	No	
Exhaust Hood Spray System	No	
Turning Gear System	No	
Generator Gas System	No	
Stator Cooling System	Yes	2.3.4.12
Hydrogen Seal Oil System	Yes	2.3.4.13
Diesel Generator System	Yes	2.3.3.10
Diesel Fuel Oil System	Yes	2.3.3.10
Diesel Lube Oil System	Yes	2.3.3.10
Diesel Jacket Water System	Yes	2.3.3.10
Diesel Generator Service Water System	Yes	2.3.3.10
Diesel Generator Starting Air System	Yes	2.3.3.10
Diesel Jacket Intake/Exhaust System	Yes	2.3.3.10
Heat Tracing System	Yes	2.3.3.11
Instrument Air System	Yes	2.3.3.12
Service Air System	Yes	2.3.3.13
Pneumatic Nitrogen System	Yes	2.3.3.14
Hydrogen Supply Systems	No	
Carbon Dioxide Supply System	No	
Fire Protection System	Yes	2.3.3.15
Fire Protection CO2 System	Yes	2.3.3.15
Lube Oil Storage and Transfer System	No	
Fuel Oil System	Yes	2.3.3.16
Halon Supply System	Yes	2.3.3.15
Sewage Treatment system	No	
Non-Contaminated Water Drainage System	Yes	2.3.3.34
Storm Drains System	No	
Oil Drains System	No	
Radioactive Floor Drains System	Yes	2.3.3.17
Radioactive Equipment Drains System	Yes	2.3.3.18

TABLE 2.2-1 (continued) LICENSE RENEWAL SCOPING RESULTS FOR MECHANICAL SYSTEMS

System Name	System in License Renewal Scope	Screening Results Application Subsection
Laundry and Hot Showers System	No	
Makeup Water Treatment System	Yes	2.3.3.19
Chlorination System	Yes	2.3.3.20
Potable Water System	Yes	2.3.3.21
Demineralized Water System	Yes	2.3.3.19
Caustic System	No	
Hydrogen Water Chemistry	No	
Acid System	No	
Process Radiation Monitoring System	Yes	2.3.3.22
Area Radiation Monitoring system	Yes	2.3.3.23
Solid Waste Processing System	No	
Liquid Waste Processing System	Yes	2.3.3.24
Augmented Off-Gas System	No	
Standby Gas Treatment System	Yes	2.3.2.7
Radwaste Sampling System	No	
Spent Fuel System	Yes	2.3.3.25
Fuel Pool Cooling and Cleanup System	Yes	2.3.3.26
Nuclear Fuels (includes Fuel Assemblies)	No	
Primary Containment Auxiliary Systems	Yes	2.3.3.33
HVAC Diesel Generator Building	Yes	2.3.3.27
Penetration Cooling System	Yes	2.3.3.8
HVAC Reactor Building	Yes	2.3.3.28
HVAC Control Building	Yes	2.3.2.9
Service Water Intake Structure Auxiliary Systems	Yes	2.3.3.33
HVAC Service Water Intake Structure	Yes	2.3.3.29
Reactor Building Auxiliary Systems	Yes	2.3.3.33
HVAC Service building	No	
HVAC Turbine Building	Yes	2.3.3.30
Augmented Off Gas Building Auxiliary Systems	Yes	2.3.3.33
HVAC Radwaste Building	Yes	2.3.3.31
Auxiliary Boiler House Auxiliary Systems	Yes	2.3.3.33
Diesel Generator Building Auxiliary Systems	Yes	2.3.3.33
Control Building Auxiliary Systems	Yes	2.3.3.33
Radwaste Building Auxiliary Systems	Yes	2.3.3.33
Non-Equipment Systems	No	
Health Physics Equipment	No	
General Mechanical Spares	No	
Analysis Software	No	

TABLE 2.2-2 LICENSE RENEWAL SCOPING RESULTS FOR STRUCTURES

Structure Name	Structure in License Renewal Scope	Screening Results Application Subsection
Intake and Discharge Canal	Yes	2.4.2.1
Refueling System	Yes	2.4.2.2
Dry Spent Fuel Storage	No	
Reactor Vessel Service Equipment	No	
Primary Containment	Yes	2.4.1.1
Switchyard and Transformer Yard Structures	Yes	2.4.2.3
Caswell Beach and Ocean Discharge Building	No	
Grounds Maintenance/Landscape	No	
Monorail Hoists	Yes	2.4.2.4
Bridge Cranes	Yes	2.4.2.5
Clean Maintenance Shop	No	
Trailers	No	
Firehouse	No	
Gantry Cranes	Yes	2.4.2.6
Service Water Intake Structure (Includes Circulating Water Intake Structure)	Yes	2.4.2.7
Reactor Building	Yes	2.4.2.8
Augmented Off-Gas Building	Yes	2.4.2.9
Hot Maintenance Shop and Storeroom	No	
Microwave Building	No	
Chlorination Building	No	
Operations Offices	No	
Administrative Building	No	
TSC/EOF Training Building	No	
Technical and Administration Building	No	
Auxiliary Boiler House	No	
Diesel Generator Building	Yes	2.4.2.10
Control Building	Yes	2.4.2.11
Service Building	No	
Turbine Building	Yes	2.4.2.12
Warehouses	No	
Radwaste Building	Yes	2.4.2.13
Water Treatment Building	Yes	2.4.2.14
Oil and Paint Storage Building	No	
Elevator System	No	
Site Roads and Parking Lots	No	

TABLE 2.2-2 (continued) LICENSE RENEWAL SCOPING RESULTS FOR STRUCTURES

Structure Name	Structure in License Renewal Scope	Screening Results Application Subsection
Site Railroad Spurs	No	
Document Control Building	No	
Miscellaneous Structures and Out Buildings	Yes	2.4.2.15
Incinerator	No	
Landfill	No	
Safety Equipment	No	
Plant Vehicles	No	
Insulation Shop Equipment	No	
Hot Machine Shop Equipment	No	
Shielding for PM Conversion	No	

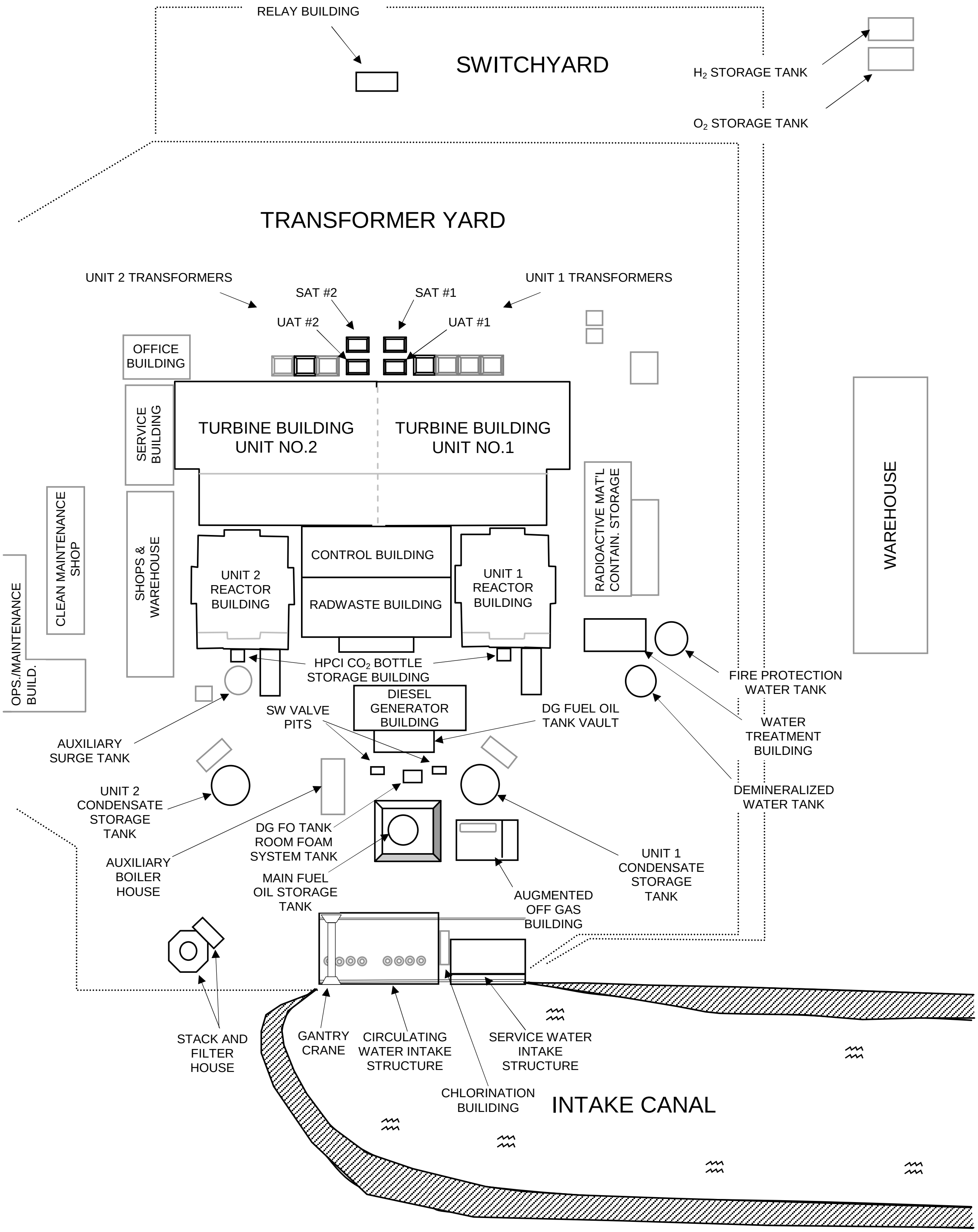
TABLE 2.2-3 LICENSE RENEWAL SCOPING RESULTS FOR ELECTRICAL/I&C SYSTEMS

System Name	System in License Renewal Scope	Screening Results Application Subsection
Nuclear Steam Supply Shutoff System	Yes	2.5
Generator System	Yes	2.5
Generator Exciter System	Yes	2.5
Generator Isolated Phase Bus System	Yes	2.5
24 Volt DC Battery System	Yes	2.5
24 Volt DC Battery Charger System	Yes	2.5
24/48 Volt DC Distribution System	Yes	2.5
230 KV Switchyard System	Yes	2.5
Start-up Auxiliary Transformers, and Unit Auxiliary Transformers	Yes	2.5
4 KV AC Distribution System	Yes	2.5
480 Volt AC Distribution System	Yes	2.5
208/120 Volt AC Distribution System	Yes	2.5
Uninterruptible AC System (Uninterruptible Power Supply)	Yes	2.5
24 KV Switchyard System	No	
Normal AC Lighting System	Yes	2.5
Emergency AC Lighting System	Yes	2.5
Emergency DC Lighting System	Yes	2.5
250 Volt DC Distribution System	Yes	2.5
125 volt DC Battery Charger System	Yes	2.5
125 Volt DC Batteries and Battery Distribution System	Yes	2.5
Lightning Protection System	No	
Cathodic Protection System	No	
Site Cables System (includes Cable, Relays, Tray and Conduit Systems)	Yes	2.5
Site Grounding System	No	
Training Simulator	No	
Emergency Response Information System (includes SPDS)	Yes	2.5
Process Computer	Yes	2.5
Main Control Boards (includes Reactor-Turbine Generator Boards - RTGB)	Yes	2.5
Annunciator Systems	Yes	2.5

TABLE 2.2-3 (continued) LICENSE RENEWAL SCOPING RESULTS FOR ELECTRICAL/I&C SYSTEMS

System Name	System in License Renewal Scope	Screening Results Application Subsection
Auxiliary Control Boards (includes Remote Shutdown Boards)	Yes	2.5
Public Address System, Communications Systems	No	
Commercial Phones and Telecopier (PABX)	No	
Sound Powered Phones	Yes	2.5
FCC Licensed Base Station Radios	No	
FCC Licensed Portable Radios	Yes	2.5
Microwave System	No	
Meteorological and Environmental Systems (Environmental Monitoring System)	Yes	2.5
Seismic Monitoring System	Yes	2.5
Caswell Beach Supervisory and Control System	Yes	2.5
Security Computer system	No	
Card Reader/Access Control System	No	
Closed Circuit Television System	No	
Intrusion Devices	No	
Security Fencing, Gates, Access Portal	No	
Physical Search System	No	
Key Control And Hardware (Security, Radiation, and Safety-related)	No	
Security Communication System	No	
Fire Detection System	Yes	2.5
Distributed I&C Fiber Optic System	No	
Site Personal Computers	No	
Site Local Area Network (LAN)	No	
Site Bar Code System	No	
Video Information System	No	
Radiochemistry Equipment	No	
General Instrumentation and Control Spares	No	
Generic Environmental Qualification	No	

FIGURE 2.2-1 BSEP PLANT STRUCTURES



2.3 SCOPING AND SCREENING RESULTS – MECHANICAL SYSTEMS

The determination of mechanical systems within the scope of License Renewal is made through the application of the process described in Section 2.1. The results of the mechanical systems scoping review are contained in Section 2.2.

Section 2.1 also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section. These identified components consequently require an aging management review for License Renewal.

The screening results for mechanical systems consist of lists of components and commodities that require aging management review. Brief descriptions of mechanical systems within the scope of License Renewal are provided as background information. Mechanical system intended functions are described for in-scope systems.

The screening results are provided below in four subsections:

- Reactor Vessel, Internals, and Reactor Coolant System,
- Engineered Safety Features Systems,
- Auxiliary Systems, and
- Steam and Power Conversion Systems.

2.3.1 REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

The Reactor Vessel, Internals, and Reactor Coolant System consist of the systems and components designed to contain and support the nuclear fuel, contain the reactor coolant, and transfer the heat produced in the reactor to the steam and power conversion systems for the production of electricity. The following systems are included in this Subsection:

1. Reactor Vessel and Internals (Subsection 2.3.1.1)

2. Neutron Monitoring System (Subsection 2.3.1.2)

3. Reactor Manual Control System (Subsection 2.3.1.3)

4. Control Rod Drive Hydraulic System (Subsection 2.3.1.4)

5. Reactor Coolant Recirculation System (Subsection 2.3.1.5)

2.3.1.1 Reactor Vessel and Internals

System Description

The Reactor Pressure Vessel (RPV) is a vertical, cylindrical pressure vessel with hemispherical heads and is of welded construction. The cylindrical shell and bottom hemispherical head of the reactor vessel were fabricated of low alloy steel plate. The shell and bottom head are clad on the interior with a stainless steel overlay. Since the vessel head is exposed to a saturated steam environment throughout its operating lifetime, stainless steel cladding is not required over its interior surfaces. The major safety consideration for the reactor vessel is the ability of the vessel to function as a radioactive material barrier. The vessel also provides a floodable core volume and provides support for the reactor vessel internals.

The RPV contains the RPV Internals, consisting of the reactor core shroud and support structure; steam separators and dryers; jet pump assemblies; control rod guide tubes; distribution lines for the feedwater, core spray, and standby liquid control systems; the incore instrumentation; and associated components. The purposes of the RPV Internals are to properly distribute the flow of coolant delivered to the RPV, to locate and support the fuel assemblies and other internal components, and to provide an inner volume containing the core that can be flooded following a break in the nuclear system process barrier external to the reactor vessel. Deflections and deformation of reactor vessel internals were limited to assure that the control rods and the core standby cooling systems, i.e., the emergency core cooling systems (ECCS), can perform their safety functions during abnormal operational transients and accidents.

The Reactor Vessel and Internals include the following equipment and components:

- Primary Nuclear Steam piping and associated equipment
- Nuclear system pressure relief system up to and including the T-quenchers in the Torus
- Feedwater piping and associated equipment
- Source Range Monitoring (SRM) detectors and dry tubes
- Intermediate Range Monitoring (IRM) detectors and dry tubes
- Local Power Range Monitoring (LPRM) detectors
- Control Rod Drive (CRD) equipment
- Control Rods

In addition, the Reactor Vessel and Internals include connected piping that is part of the Reactor Coolant Pressure boundary (RCPB). The RCPB includes all pressure containing components such as pressure vessels, piping, pumps, and valves that are:

1. Part of the reactor coolant system which extends to and includes the outermost containment isolation valve in the main steam and feedwater piping,

2. Connected to the reactor coolant system up to and including any and all of the following:

    a. The outermost containment isolation valve in system piping which penetrates primary reactor containment,

    b. The second of two valves normally closed during normal reactor operation in system piping which does not penetrate primary reactor containment, and

    c. The reactor coolant system safety and relief valves.

Isolation valves in the Nuclear Steam Supply piping and primary reactor containment function to provide timely protection against the onset and consequences of accidents involving potential release of radioactive materials from the fuel and nuclear system process barriers. The valves are automatically isolated whenever monitored process variables exceed pre-selected operational limits.

The nuclear system pressure relief system includes safety relief valves (SRVs) and associated piping and prevents overpressurization of the nuclear system by discharging reactor steam to the suppression pool; this protects the nuclear system process barrier from failure, which could result in the release of fission products. In addition, the automatic depressurization feature of the nuclear system pressure relief system acts in conjunction with the ECCS for reducing pressure and allowing reflooding the core following a postulated small to medium break in the nuclear system process barrier. This protects the reactor fuel cladding from failure due to overheating.

Instrumentation connected to the Reactor Vessel and Internals provides signals to the Reactor Protection System and ESF actuation systems which initiate automatic protective actions following postulated accidents and transients. Several of these instruments provide post-accident monitoring. Pressure boundary components in the instrumentation lines support the RCPB function and are in scope.

Components in the Reactor Vessel and Internals are credited with mitigation of events evaluated using Alternative Source Term analyses by providing a fission product barrier. The Reactor Vessel and Internals contain non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. The system is credited for safe shutdown following fires, for coping with station blackout events, and for response to a postulated ATWS event. The system contains components that are environmentally qualified.

In addition, the Reactor Vessel and Internals contain non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The Reactor Vessel and Internals are in the scope of License Renewal because they contain:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components that are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires, anticipated transients without scram, and station blackout events,

4. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The Reactor Vessel and Internals components are discussed further in UFSAR Sections 3.9.5, 4.5, 4.6, 5.1, 5.2, and 5.3.

The License Renewal scoping boundaries for the Reactor Vessel and Internals are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25020-LR, Sheet 3A, 3B, 3C	D-02520-LR, Sheet 3A, 3B, 3C	None
D-25021-LR, Sheet 1A, 1B, 1C	D-02521-LR, Sheet 1A, 1B, 1C	
D-25022-LR, Sheet 2A, 2B, 2C	D-02522-LR, Sheet 2A, 2B, 2C	

Components Subject to AMR

The table below identifies the Reactor Vessel and Internals components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System - Summary of Aging Management Evaluation - Reactor Vessel and Internals.

TABLE 2.3.1-1 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR VESSEL AND INTERNALS

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Top Head Enclosure (Top Head)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Top Head Enclosure (Nozzles (Vent, Top Head Spray or Reactor Core Isolation Cooling [RCIC], and Spare))	M-1 Provide pressure-retaining boundary
Top Head Enclosure (Head Flange)	M-1 Provide pressure-retaining boundary
Top Head Enclosure (Closure Studs and Nuts)	M-1 Provide pressure-retaining boundary
Vessel Shell (Vessel Flange)	M-1 Provide pressure-retaining boundary
Vessel Shell (Upper Shell)	M-1 Provide pressure-retaining boundary
Vessel Shell (Intermediate Nozzle Shell)	M-1 Provide pressure-retaining boundary
Vessel Shell (Intermediate Beltline Shell)	M-1 Provide pressure-retaining boundary
Vessel Shell (Lower Shell)	M-1 Provide pressure-retaining boundary
Vessel Shell (Beltline Welds)	M-1 Provide pressure-retaining boundary
Vessel Shell (Attachment Welds)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Nozzles (Main Steam)	M-1 Provide pressure-retaining boundary
Nozzles (Feedwater)	M-1 Provide pressure-retaining boundary
Nozzles (Control Rod Drive (CRD) Return Line)	M-1 Provide pressure-retaining boundary
Nozzles (Recirculation Outlet)	M-1 Provide pressure-retaining boundary
Nozzles (Recirculation Inlet)	M-1 Provide pressure-retaining boundary
Nozzles (Low Pressure Core Spray (LPCS) - Unit 1)	M-1 Provide pressure-retaining boundary
Nozzles (Low Pressure Core Spray (LPCS) - Unit 2)	M-1 Provide pressure-retaining boundary
Nozzles (Shell Flange)	M-1 Provide pressure-retaining boundary
Nozzles Safe Ends (Low Pressure Core Spray (LPCS))	M-1 Provide pressure-retaining boundary M-8 Provide adequate flow in a properly distributed spray pattern
Nozzles Safe Ends (CRD Return Line)	M-1 Provide pressure-retaining boundary
Nozzles Safe Ends (Recirc. Water Inlet and Outlet)	M-1 Provide pressure-retaining boundary
Nozzles Safe Ends (Feedwater - Unit 1)	M-1 Provide pressure-retaining boundary
Nozzles Safe Ends (Feedwater - Unit 2)	M-1 Provide pressure-retaining boundary
Nozzles Safe Ends (Standby Liquid Control)	M-1 Provide pressure-retaining boundary
Nozzles Safe Ends (Instrumentation)	M-1 Provide pressure-retaining boundary
Penetrations (CRD Stub Tubes)	M-1 Provide pressure-retaining boundary
Penetrations (Instrumentation)	M-1 Provide pressure-retaining boundary
Penetrations (Jet Pump Instrument)	M-1 Provide pressure-retaining boundary
Penetrations (Standby Liquid Control)	M-1 Provide pressure-retaining boundary
Penetrations (Flux Monitor)	M-1 Provide pressure-retaining boundary
Penetrations (Drain Line)	M-1 Provide pressure-retaining boundary
Reactor Vessel (Boiling Water Reactor) (Bottom Head)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity

TABLE 2.3.1-1 (continued) COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR VESSEL AND INTERNALS

Reactor Vessel (Boiling Water Reactor) (Support Skirt and Attachment Welds)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Thermal Sleeves (Feedwater - Unit 1)	M-4 Provide structural support/seismic integrity
Thermal Sleeves (Feedwater - Unit 2)	M-4 Provide structural support/seismic integrity
Thermal Sleeves (Low Pressure Core Spray (LPCS))	M-4 Provide structural support/seismic integrity
Core Shroud and Core Plate (Core Shroud (Upper, Central, Lower))	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Core Shroud and Core Plate (Core Plate)	M-4 Provide structural support/seismic integrity
Core Shroud and Core Plate (Core Plate Bolts)	M-4 Provide structural support/seismic integrity
Core Shroud and Core Plate (Access Hole Cover)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Core Shroud and Core Plate (Shroud Support Structure)	M-4 Provide structural support/seismic integrity
Core Shroud and Core Plate (Core Shroud Repair Hardware)	M-4 Provide structural support/seismic integrity
Core Shroud and Core Plate (Core Plate Plugs)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Reactor Vessel Internals (Boiling Water Reactor) (Top Guide)	M-4 Provide structural support/seismic integrity
Core Spray Lines and Spargers (Core Spray Lines Headers)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity M-8 Provide adequate flow in a properly distributed spray pattern
Core Spray Lines and Spargers (Spray Rings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity M-8 Provide adequate flow in a properly distributed spray pattern
Core Spray Lines and Spargers (Spray Nozzles)	M-8 Provide adequate flow in a properly distributed spray pattern
Core Spray Lines and Spargers (Thermal Sleeves)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity M-8 Provide adequate flow in a properly distributed spray pattern
Jet Pump Assemblies (Thermal Sleeve)	M-4 Provide structural support/seismic integrity
Jet Pump Assemblies (Inlet Header)	M-4 Provide structural support/seismic integrity
Jet Pump Assemblies (Riser Brace Arm)	M-4 Provide structural support/seismic integrity
Jet Pump Assemblies (Holddown Beams)	M-4 Provide structural support/seismic integrity
Jet Pump Assemblies (Inlet Elbow)	M-4 Provide structural support/seismic integrity
Jet Pump Assemblies (Mixing Assembly)	M-4 Provide structural support/seismic integrity
Jet Pump Assemblies (Diffuser)	M-4 Provide structural support/seismic integrity

TABLE 2.3.1-1 (continued) COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR VESSEL AND INTERNALS

Jet Pump Assemblies (Castings)	M-4 Provide structural support/seismic integrity
Jet Pump Assemblies (Jet Pump Sensing Line)	M-4 Provide structural support/seismic integrity
Jet Pump Assemblies (Jet Pump Holddown Beam Keeper, Lock Plate, and Bolt)	M-4 Provide structural support/seismic integrity
Fuel Supports and Control Rod Drive (CRD) Assemblies (Orificed Fuel Support)	M-4 Provide structural support/seismic integrity
Fuel Supports and Control Rod Drive (CRD) Assemblies (CRD Housing)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Instrumentation (Intermediate Range Monitor (IRM) Dry Tubes)	M-1 Provide pressure-retaining boundary
Instrumentation (Source Range Monitor (SRM) Dry Tubes)	M-1 Provide pressure-retaining boundary
Reactor Vessel Internals (Boiling Water Reactor - Non-safety Related) (Steam Dryer)	M-4 Provide structural support/seismic integrity
Reactor Vessel Internals (Boiling Water Reactor - Non-safety Related) (Shroud Head and Separators)	M-4 Provide structural support/seismic integrity
Reactor Vessel Internals (Boiling Water Reactor - Non-safety Related) (Feedwater Spargers)	M-4 Provide structural support/seismic integrity
Reactor Vessel Internals (Boiling Water Reactor - Non-safety Related) (Surveillance Capsule Holder)	M-4 Provide structural support/seismic integrity
Piping and Fittings (Main Steam)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Piping and Fittings (Feedwater)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Piping and Fittings (Reactor Vessel Head Vent Components	M-1 Provide pressure-retaining boundary
Valves (Body)	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Valves)	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage

TABLE 2.3.1-1 (continued) COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR VESSEL AND INTERNALS

Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping Specialties)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction M-4 Provide structural support/seismic integrity
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Air Receiver (Shell and Access Cover)	M-1 Provide pressure-retaining boundary

2.3.1.2 Neutron Monitoring System (NMS)

<u>System Description</u>

The NMS is an in-core neutron monitoring system, which detects and monitors neutron flux in the reactor core. The NMS is designed to: a) detect conditions in the core that threaten the overall integrity of the fuel barrier due to excessive power generation and to provide signals to the reactor protection system, so that the release of radioactive materials from the fuel barrier is limited, b) provide information for the efficient, expedient operation and control of the reactor, and c) prevent reactor coupled neutronic/thermal-hydraulic instabilities from occurring. The NMS provides the capability to shutdown the reactor via the Reactor Protection System (RPS) following a design basis event and maintains it in a safe shutdown condition.

The NMS is composed of the following subsystems: a) Source Range Monitoring (SRM) subsystem, b) Intermediate Range Monitoring (IRM) subsystem, c) Local Power Range Monitoring (LPRM) subsystem which includes the Period-Based Detection System (PBDS) feature, d) Average Power Range Monitoring (APRM) subsystem which includes the Oscillation Power Range Monitor (OPRM) subsystem, e) Rod Block Monitor (RBM) subsystem, and f) Traversing In-Core Probe (TIP) subsystem. It should be noted that only the IRM and APRM subsystems generate RPS trip signals to shutdown (scram) the reactor. In addition, NMS components support post-accident monitoring of safety related systems. The scope of this system includes all detectors, detector assemblies, guide tubes, drive units, NMS cabinets, associated control logic circuitry, power supplies and readout devices. The NMS contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. The majority of NMS components are addressed as electrical and I&C component/commodities in Section 2.5. However, portions of the NMS interface with the reactor vessel and provide the RCPB function and are addressed as mechanical components/commodities.

The NMS is in the scope of License Renewal because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The NMS is described in UFSAR Section 7.6.1.1.

No License Renewal boundary drawings are provided to show the License Renewal scoping boundaries of the NMS. The boundaries between the NMS and the reactor vessel are at the lower flanges of the in-core housing for the SRMs, IRMs, and LPRMs; the SRM and IRM dry tubes; and the LPRM sealed instrument tubes. Additional boundaries exist at the sealing surface between the tubes and the flange and at any LPRM tube internal seal. The lower flange, the LPRM sealed instrument tubes, the SRM/IRM dry tubes, and the internal seals are in the NMS.

Components Subject to AMR

The table below identifies the NMS components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System - Summary of Aging Management Evaluation – Neutron Monitoring System (NMS).

TABLE 2.3.1-2 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: NEUTRON MONITORING SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Instrumentation (Incore Neutron Flux Monitor Guide Tubes)	M-1 Provide pressure-retaining boundary
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Valves)	M-1 Provide pressure-retaining boundary
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping Specialties)	M-1 Provide pressure-retaining boundary

2.3.1.3 Reactor Manual Control System

System Description

The purpose of the Reactor Manual Control System (RMCS) is to allow the operator to control core reactivity by inserting and withdrawing control rods. The system consists of the electrical components and logic circuits required to monitor and manipulate the control rods. The RMCS also acts to block rod motion and/or selection in response to protective signals generated by other plant monitoring systems. Supporting the RMCS is the Rod Position Information System (RPIS) which provides the operator with a means for determining the positions of all control rods in the core and for observing the position of a selected rod in relation to specific adjacent rods. RPIS also provides rod position and identification data to the process computer. The RPIS is considered as a subsystem of RMCS. The function of the Rod Worth Minimizer (RWM) System, another RMCS subsystem, is to implement features that provide: (1) protection against the existence of a rod worth which could result in significant fuel damage in the unlikely event of a control rod drop accident, (2) implementation of the banked position withdrawal sequence as a hard wired system, and (3) provision of several rod position indication data and control rod testing functions. The system contains non-safety related electrical/I&C equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. The majority of RMCS components are addressed as electrical and I&C component/commodities in Section 2.5. However, the BSEP Unit 2 RMCS contains non-safety related instrument tubing components that have the potential to cause an adverse physical interaction with safety related equipment. These mechanical components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The RMCS is in the scope of License Renewal because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The RMCS is described in UFSAR Section 7.7.1.8.

The License Renewal scoping boundaries for the RMCS are shown on the following License Renewal boundary drawings for Unit 2. (License Renewal boundary drawings have been submitted separately for information only.) Note that the corresponding in-scope components for Unit 1 are part of the CRD Hydraulic System discussed in the following Subsection.

BSEP Unit 1	BSEP Unit 2	BSEP Common
None	D-02516-LR, Sheet 1A, 1B	None

Components Subject to AMR

The table below identifies the Reactor Manual Control System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System - Summary of Aging Management Evaluation – Reactor Manual Control System.

TABLE 2.3.1-3 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR MANUAL CONTROL SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings)	M-1 Provide pressure-retaining boundary

2.3.1.4 Control Rod Drive (CRD) Hydraulic System

System Description

The CRD hydraulic system supplies the pressure to and controls the flow requirements of the control rod drives. The CRD Hydraulic System supplies water at the proper pressures and in sufficient flow to the hydraulic control units (HCU). Each HCU controls the flow to and from a CRD. The water discharged from the drives during a scram flows through the HCU to the scram discharge volume. During a normal control rod positioning operation, the water discharged from a drive flows through its HCU and exhaust header to the cooling water header. The control rod drive hydraulic supply and discharge subsystems control the pressure and flows required for the operation of the CRD mechanisms and also to supply backfill flow to the cold reference legs for reactor vessel level instrumentation. The CRD Hydraulic System is an open loop system consisting of two control rod drive water pumps, two drive water filters, a flow control station, a drive water pressure control station, hydraulic control units for each of the 137 control rod drive mechanisms, a scram discharge volume, interconnecting piping, associated valves, controls and instrumentation. Reactor coolant pressure retaining portions of the CRD units attached to the RPV are considered part of the Reactor Vessel and Internals System.

The safety objective of the CRD Hydraulic System is to insert control rods to provide a means of rapid reactor shutdown, thus limiting damage to the fuel barrier and primary system pressure. The scram discharge volume of the CRD Hydraulic System is monitored for accumulated water, and a reactor scram signal will be generated before the volume reaches a point that could interfere with a scram. Also, the CRD Hydraulic

System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. The system provides response to an ATWS event and contains components that are environmentally qualified to function in harsh environment areas.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment and non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The CRD Hydraulic System is in the scope of License Renewal because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,
2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,
3. Components that are relied on during postulated anticipated transients without scram events,
4. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The CRD Hydraulic System is discussed in UFSAR Sections 3.9.4 and 4.6.

The License Renewal scoping boundaries for the CRD Hydraulic System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25016-LR, Sheet 1A, 1B	D-02516-LR, Sheet 1A, 1B	None
D-25017-LR, Sheet 2A, 2B	D-02517-LR, Sheet 2A, 2B	

Components Subject to AMR

The table below identifies the CRD Hydraulic System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System - Summary of Aging Management Evaluation – Control Rod Drive (CRD) Hydraulic System.

TABLE 2.3.1-4 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: CONTROL ROD DRIVE (CRD) HYDRAULIC SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Valves)	M-1 Provide pressure-retaining boundary
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping Specialties)	M-1 Provide pressure-retaining boundary
Hydraulic Control Units (Tanks)	M-1 Provide pressure-retaining boundary
Hydraulic Control Units (Rupture Disks)	M-1 Provide pressure-retaining boundary
Hydraulic Control Units (Nitrogen Fittings)	M-1 Provide pressure-retaining boundary
Hydraulic Control Units (Filters)	M-1 Provide pressure-retaining boundary M-2 Provide filtration
Hydraulic Control Units (Miscellaneous Piping)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
CRD Pumps (CRD Pump Casing)	M-1 Provide pressure-retaining boundary
CRD Pumps (CRD Pump Gearbox Coolers)	M-1 Provide pressure-retaining boundary
CRD Pumps (CRD Pump Skid Piping and Valves)	M-1 Provide pressure-retaining boundary
Piping (Piping and Fittings)	M-4 Provide structural support/seismic integrity
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity

2.3.1.5 Reactor Coolant Recirculation System

System Description

The Reactor Coolant Recirculation System regulates coolant flow through the core. Adjustment of the core coolant flow rate changes reactor power output, thus providing a means of following plant load demand without adjusting control rods.

The Reactor Coolant Recirculation System consists of two recirculation pump loops external to the reactor vessel that provide the piping path for the driving flow of water to the reactor vessel internal jet pumps. Each external loop contains one high-capacity, motor-driven recirculation pump and three motor-operated gate valves for pump maintenance. Each pump discharge line contains a venturi-type flowmeter nozzle. The recirculation loops are a part of the nuclear system process barrier (RCPB) and are located inside the Drywell. The arrangement of the recirculation system is such that a piping failure cannot compromise the integrity of the floodable inner volume of the reactor vessel. To support ECCS following a LOCA, the recirculation pump discharge valves are closed automatically to direct LPCI flow upward through the jet pump drive lines and into the core floodable volume.

The Reactor Coolant Recirculation System provides flow paths out of the reactor pressure vessel for Residual Heat Removal (RHR) and Reactor Water Cleanup Systems and into the reactor vessel for RHR shutdown cooling and Low Pressure Coolant Injection. Reactor Coolant Recirculation instrumentation circuits support the trip setpoint for average power range neutron monitor high flux trip and support post-accident monitoring of valve positions in support of containment isolation.

The coolant flow rate through the reactor core is varied by using variable frequency motor-generator sets and flow control instrumentation to change the speed of the centrifugal recirculation pumps. The system has sufficient flow coastdown characteristics to maintain fuel thermal margins during operational loss of flow transients.

A recirculation pump trip on reactor high pressure or reactor low water level has been provided to limit the consequences of postulated ATWS events. The Reactor Coolant Recirculation System is credited for shutdown following a fire. Components in the system are credited for compliance with EQ requirements. In addition, the Reactor Coolant Recirculation System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The Reactor Coolant Recirculation System is in the scope of License Renewal because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and anticipated transients without scram,

4. Components that are part of the Environmental Qualification Program.

<u>UFSAR and Drawing References</u>

The Reactor Coolant Recirculation System is discussed in UFSAR Section 5.4.1.

The License Renewal scoping boundaries for the Reactor Coolant Recirculation System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25018-LR, Sheet 1A, 1B	D-02518-LR, Sheet 1A, 1B	None
D-25048-LR, Sheet 2A, 2B	D-02548-LR, Sheet 2A, 2B	

Components Subject to AMR

The table below identifies the Reactor Coolant Recirculation System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.1.2-5 Reactor Vessel, Internals, and Reactor Coolant System - Summary of Aging Management Evaluation – Reactor Coolant Recirculation System.

TABLE 2.3.1-5 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR COOLANT RECIRCULATION SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Recirculation)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1 Provide pressure-retaining boundary
Recirculation Pump (Casing)	M-1 Provide pressure-retaining boundary
Recirculation Pump (Cover)	M-1 Provide pressure-retaining boundary
Recirculation Pump (Seal Flange)	M-1 Provide pressure-retaining boundary
Recirculation Pump (Closure Bolting)	M-1 Provide pressure-retaining boundary
Valves (Body)	M-1 Provide pressure-retaining boundary
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Valves)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping Specialties)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings - Closed Cooling Water)	M-1 Provide pressure-retaining boundary

2.3.2 ENGINEERED SAFETY FEATURES SYSTEMS

Engineered Safety Features Systems consist of systems and components designed to function under accident conditions to minimize the severity of an accident or to mitigate the consequences of an accident. Section 6.0 of the BSEP UFSAR provides a list of engineered safety features (ESFs). These are:

1. Containment Systems

    a) Primary Containment (Refer to Subsection 2.4.1)
    b) Secondary Containment (Refer to Subsection 2.4.2)
    c) Containment Heat Removal System (CHRS) (CHRS is a Residual Heat Removal (RHR) System function; refer to Subsection 2.3.2.1.)
    d) Containment Isolation System (Refer to Subsection 2.3.2.2.)
    e) Combustible Gas Control (Combustible gas control is accomplished by the Containment Atmosphere Control (CAC) System; refer to Subsection 2.3.2.3.)

2. Core Standby Cooling Systems

    a) High Pressure Coolant Injection (HPCI) System (Refer to Subsection 2.3.2.4.)
    b) Automatic Depressurization System (ADS) (Refer to Subsection 2.3.2.5.)
    c) Core Spray (CS) System (Refer to Subsection 2.3.2.6.)
    d) Low Pressure Coolant Injection (LPCI) System (LPCI is an RHR System function. Refer to Subsection 2.3.2.1.)

3. Standby Gas Treatment System (Refer to Subsection 2.3.2.7.)

4. Habitability Systems

    Control Room habitability systems include equipment, supplies, and procedures that give assurance the operating staff can remain in the Control Room and take effective actions to operate the plant safety under normal and postulated accident conditions. The Control Room Emergency Ventilation System and the Control Room Air Conditioning System are both required to maintain Control Room Habitability. These systems are part of the HVAC Control Building System. (Refer to Subsection 2.3.2.9.)

5. Additional ESFs

    a) Overpressure Protection (This is a function of the Reactor Vessel and Internals systems; refer to Subsection 2.3.1.)
    b) Main Steam Isolation Valves (This is a function of the Reactor Vessel and Internals systems; refer to Subsection 2.3.1.)
    c) Control Rod Drive Housing Support System (Refer to Section 2.4.)
    d) Control Rod Drive Velocity Limiter (This is a function of the Reactor Vessel and Internals systems; refer to Subsection 2.3.1.)
    e) Main Steam Line Flow Restrictor (This is a function of the Reactor Vessel and Internals systems; refer to Subsection 2.3.1.)
    f) Standby Liquid Control System (Refer to Subsection 2.3.2.8.)
    g) Reactor Protection System (Refer to Subsection 2.3.2.10.)

Based on the above, the following Engineered Safety Features Systems are addressed in this Subsection:

1. Residual Heat Removal (RHR) System (Subsection 2.3.2.1)
2. Containment Isolation System (Subsection 2.3.2.2)
3. Containment Atmosphere Control (CAC) System (Subsection 2.3.2.3)
4. High Pressure Coolant Injection (HPCI) System (Subsection 2.3.2.4)
5. Automatic Depressurization System (ADS) (Subsection 2.3.2.5)
6. Core Spray (CS) System (Subsection 2.3.2.6)
7. Standby Gas Treatment System (SGTS) (Subsection 2.3.2.7)
8. Standby Liquid Control (SLC) System (Subsection 2.3.2.8)
9. HVAC Control Building System (Subsection 2.3.2.9)
10. Reactor Protection System (Subsection 2.3.2.10)

2.3.2.1 Residual Heat Removal (RHR) System

System Description

The RHR System operates in several modes to remove heat from plant systems or to provide water to plant systems during normal and post-accident conditions. The functions of Low Pressure Coolant Injection (LPCI), Suppression Pool Cooling, and Drywell Spray Cooling are safety related and, therefore, are RHR System intended functions for License Renewal. The RHR System functions of normal Shutdown Cooling, Spent Fuel Pool cooling, Torus Spray, hydrogen mixing (via containment sprays), supplying water to systems via the Service Water System cross-connect, and RHR System leak detection are not safety related and, therefore, are not RHR System intended functions.

In order to minimize the possibility of a single event causing the loss of the entire RHR System, the system is divided into two loops which are physically separated from each other. One loop, consisting of one heat exchanger, two main system pumps in parallel, and associated piping, is located in one area of the Reactor Building. The other heat exchanger, pumps, and piping, forming a second loop, are located in another area of the Reactor Building.

The LPCI subsystem of the RHR System provides core inventory replacement in the event of a LOCA. The LPCI subsystem is actuated automatically when potential LOCA conditions are detected by plant instrument systems, at which time the LPCI (RHR) pumps are signaled to start. When the reactor vessel pressure is below system design pressure, the LPCI injection valve opens and subcooled LPCI flow enters the reactor vessel and the recirculation loops. The maximum flow capacity is determined for the design break of a recirculation line where reactor depressurization is sufficient to allow the LPCI to flood the core and limit fuel cladding temperature. LPCI protection also extends to a small break in which the Control Rod Drive water pumps, the RCIC System and the HPCI System all are unable to maintain the reactor vessel water level and the Automatic Depressurization System (ADS) has operated to reduce the reactor vessel pressure such that LPCI subsystem can provide core cooling. The LPCI mode of RHR provides sufficient makeup to restore and maintain the coolant inventory in the Reactor Vessel to the jet pump inlet (two-thirds core height) following a Design Basis LOCA so that the core is adequately cooled.

In addition to LPCI, the RHR System can also be used to remove decay and sensible heat from the Reactor primary system during normal shutdown in order to refuel and service the reactor (shutdown cooling mode). Also, an alternate method of decay heat removal is available should the normal shutdown cooling be unavailable. The method uses one loop of RHR or CS pump to circulate water from the suppression pool to the vessel and then back to the suppression pool through either one or two open SRVs. Decay heat can be removed either directly by the RHR heat exchanger or by use of the RHR System in the Suppression Pool cooling mode.

To provide primary containment cooling either during normal operation or following a design basis accident, the RHR System can be aligned to cool the Suppression Pool water (Suppression Pool Cooling mode). In addition, the system can be aligned to direct flow to spray headers in the Drywell and above the Suppression Pool to provide for containment cooling (containment cooling/spray mode). The Drywell and Torus spray condenses steam and cools non-condensable gases in the containment to aid in reducing containment pressure and temperature after a LOCA.

A cross-tie is provided between the RHR System and the Service Water System. This permits pumping service water directly to the Reactor Vessel via the LPCI flow path or into the Containment via the containment spray header.

Connections are provided on the shutdown cooling piping of the RHR System so that RHR heat exchangers may be used to assist fuel pool cooling when required. The RHR System can supplement the Fuel Pool Cooling and Cleanup System only if the reactor is shut down and when plant operating modes permit use of the RHR System in this manner.

Portions of the RHR System maintain the integrity of the RCPB; RHR System lines penetrate the Primary Containment and portions of the system perform the containment isolation function. RHR instrumentation and control circuits activate protective actions and support post-accident monitoring of safety related systems. The RHR System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. Also, the RHR System is credited with safe shutdown following a fire and for compliance with SBO and EQ requirements.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment and non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The RHR System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events,

4. Components that are part of the Environmental Qualification Program.

<u>UFSAR and Drawing References</u>

The RHR System is described in detail in Sections 5.4.7 and 6.3 of the BSEP UFSAR.

The License Renewal scoping boundaries for the Residual Heat Removal System are shown on the following License Renewal boundary drawing. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25025-LR, Sheet 1A, 1B	D-02525-LR, Sheet 1A, 1B	None
D-25026-LR, Sheet 2A, 2B	D-02526-LR, Sheet 2A, 2B	

Components Subject to AMR

The table below identifies the RHR System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.2.2-1 Engineered Safety Features - Summary of Aging Management Evaluation – Residual Heat Removal (RHR) System.

TABLE 2.3.2-1 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Low Pressure Coolant Injection (LPCI) System)	M-1 Provide pressure-retaining boundary
Valves (Body)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Low-Pressure Coolant Injection (LPCI) and Residual Heat Removal (RHR))	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Piping and Fittings (Lines to Suppression Chamber (SC))	M-1 Provide pressure-retaining boundary
Piping and Fittings (Lines to Drywell and Suppression Chamber Spray System (DSCSS))	M-1 Provide pressure-retaining boundary
Piping and Fittings (Piping specialties)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction M-4 Provide structural support/seismic integrity M-6 Provide insulation/thermal resistance
Piping and Fittings (Misc. auxiliary and drain piping and valves)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Piping and Fittings (restrictive orifices/flow elements)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Bowl/Casing)	M-1 Provide pressure-retaining boundary
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Suction Head)	M-1 Provide pressure-retaining boundary
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Discharge Head)	M-1 Provide pressure-retaining boundary

TABLE 2.3.2-1 (continued) COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Valves (Check, Control, Hand, Motor Operated, and Relief Valves) (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Heat Exchangers (RHR and LPCI) (Tubes)	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Heat Exchangers (RHR and LPCI) (Tubesheet)	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Heat Exchangers (RHR and LPCI) (Channel Head)	M-1 Provide pressure-retaining boundary
Heat Exchangers (RHR and LPCI) (Shell)	M-1 Provide pressure-retaining boundary
Drywell and Suppression Chamber Spray System(DSCSS) (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Drywell and Suppression Chamber Spray System(DSCSS) (Spray Nozzles)	M-1 Provide pressure-retaining boundary M-8 Spray Pattern
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers)	M-1 Provide pressure-retaining boundary M-2 Provide filtration
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Shell)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Channel Head and Access Cover)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Tubes)	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Pump (Casing)	M-1 Provide pressure-retaining boundary

2.3.2.2 Containment Isolation System

System Description

The Containment Isolation System is an engineered safety feature that provides for the closure or integrity of primary and secondary containment penetrations to prevent leakage of uncontrolled or unmonitored radioactive materials to the environment following postulated accidents.

The pressure boundary portions of electrical penetrations and miscellaneous/spare mechanical penetrations that are not associated with a process system are included in the civil structural screening described in Section 2.4. The electrical portions of containment electrical penetrations are included in the electrical screening described in Section 2.5.

Process systems with primary and secondary containment isolation valves and dampers are listed below: Systems that include primary containment isolation valves are:

1. Reactor Vessel and Internals

2. Neutron Monitoring System
3. Control Rod Drive Hydraulic System
4. Reactor Water Cleanup System
5. Reactor Coolant Recirculation System
6. Core Spray System
7. Standby Liquid Control System
8. Residual Heat Removal System
9. Containment Atmospheric Control System
10. High Pressure Coolant Injection System
11. Reactor Core Isolation Cooling System
12. Post Accident Sampling System
13. Torus Drain System
14. Reactor Building Closed Cooling Water System
15. Instrument Air System
16. Radioactive Floor Drains System
17. Radioactive Equipment Drains System
18. Reactor Protection System

Primary containment isolation valves for these systems are listed in UFSAR Table 6-11. The containment isolation valves for these systems are included in the screening results for the above system described elsewhere in this Section.

Systems that include secondary containment isolation dampers are:

1. Standby Gas Treatment System
2. HVAC Reactor Building

The containment isolation dampers for these systems were determined to be subject to aging management review and are included in the screening results for the above systems described elsewhere in this Section.

UFSAR and Drawing References

The Containment Isolation System is described in Sections 6.2.3 and 6.2.4 of the BSEP UFSAR.

The License Renewal scoping boundaries for the Containment Isolation System are identified in the discussion of the applicable systems elsewhere in this Section.

Components Subject to AMR

Containment Isolation System components for the above systems have been screened during the screening of each system that includes containment isolation valves. Therefore, the Containment Isolation System components that require aging management review are included in the screening results for each system described elsewhere in this Section. No separate listing of Containment Isolation System components/commodities requiring aging management review is provided.

2.3.2.3 Containment Atmospheric Control (CAC) System

System Description

The CAC System consists of three major subsystems: the containment inerting subsystem, the Containment Atmospheric Dilution (CAD) subsystem, and the containment atmospheric makeup subsystem (decommissioned). Of these, only the Containment Atmospheric Dilution (CAD) subsystem is designed to function as an ESF system.

Based on NRC guidance to control either hydrogen or oxygen concentration within the flammability limit following a LOCA, the CAD subsystem provides long-term nitrogen makeup to the primary containment to maintain oxygen concentration at or below 5 percent. This function is accomplished by vaporizing liquid nitrogen and feeding it into the containment as required to maintain an oxygen concentration at or below 5 percent. Since this subsystem is designed to ESF standards, all equipment required for CAD service is designed with suitable redundancy and interconnections such that no single failure of an active component will render the system inoperable. This equipment includes a nitrogen storage vessel, electric liquid nitrogen vaporizers, instrumentation, and appropriate piping, flow control stations, and isolation valves. Hydrogen and oxygen concentrations are monitored following a LOCA by redundant hydrogen and oxygen analyzers. The CAD subsystem nitrogen supply also provides a backup to the instrument air header in the Augmented Off-Gas Building upon loss of instrument air for the CAD subsystem.

The CAC System supports the capability of purging the Primary Containment through the SGTS to reduce pressure resulting from nitrogen addition. In order to limit containment pressure to one-half of design pressure, venting through the SGTS can be initiated several days following a LOCA. Purging provides a method for limiting containment pressure and for controlling combustible gas concentrations in the containment. (An additional containment vent path is provided by the CAC System Hardened Wetwell Vent subsystem. This subsystem provides a vent path for beyond design basis, severe accident venting. Therefore, this function is not a License Renewal intended function.)

CAC System lines penetrate the Primary Containment, and portions of the system perform the containment isolation function. Instrumentation and control circuits in the CAC System support post-accident monitoring of safety related systems. The CAC System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. In addition, the CAC System is credited with safe shutdown following a fire and for compliance with SBO and EQ requirements.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment and non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The CAC System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events,

4. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The CAC System is described in Section 6.2.5 of the BSEP UFSAR.

The License Renewal scoping boundaries for the CAC System are shown on the following License Renewal boundary drawing. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25015-LR, Sheet 1A, 1B, 1C, 1D	D-02515-LR, Sheet 1A, 1B, 1C, 1D	D-02560-LR, Sheet 2A
D-73026-LR, Sheet 1, 2	D-07326-LR, Sheet 1, 2	
D-72018-LR	D-07218-LR	

Components Subject to AMR

The table below identifies the CAC System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.2.2-2 Engineered Safety Features - Summary of Aging Management Evaluation – Containment Atmospheric Control (CAC) System.

TABLE 2.3.2-2 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: CONTAINMENT ATMOSPHERIC CONTROL SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Containment Atmospheric Dilution/Control System (Valves)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Containment Atmospheric Dilution/Control System (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Containment Atmospheric Dilution/Control System (Piping Specialties)	M-1 Provide pressure-retaining boundary M-2 Provide filtration M-3 Provide flow restriction M-4 Provide structural support/seismic integrity
Containment Atmospheric Dilution/Control System (Tanks)	M-1 Provide pressure-retaining boundary
Containment Atmospheric Dilution/Control System (Pumps)	M-1 Provide pressure-retaining boundary
Containment Atmospheric Dilution/Control System (Heat Exchangers)	M-1 Provide pressure-retaining boundary

2.3.2.4 High Pressure Coolant Injection (HPCI) System

System Description

Each BSEP Unit has a dedicated HPCI System. The HPCI System consists of a steam turbine that drives a constant flow pump, and system piping, valves, controls, and instrumentation. The principal HPCI System equipment is installed in the Reactor Building. Suction piping comes from the Condensate Storage Tank (CST) and the suppression pool. Injection water is piped to the reactor feedwater pipe at a T-connection. Steam supply for the turbine is piped from a main steam header in the primary containment. This piping is provided with an isolation valve on each side of the Drywell barrier. Remote controls for valves and turbine operation are provided in the Control Room.

If a LOCA occurs, the HPCI System is actuated automatically. Reactor steam generated by core decay heat and stored heat is extracted from a main steam header upstream of the main steam isolation valves to drive the HPCI turbine which drives the HPCI pump. The HPCI pump returns subcooled water to the reactor vessel over a wide range of pressures. The HPCI System flow is distributed symmetrically around the periphery of the vessel by the feedwater sparger. Extraction of steam from the vessel and the return of subcooled water to the vessel results in depressurization as well as inventory makeup. Two sources of water are available. Initially, the system uses demineralized water from the CST. When inventory is drawn down to a low water level, automatic transfer to the suppression pool occurs.

The primary purpose of HPCI System is to maintain reactor vessel inventory after small breaks which do not depressurize the reactor vessel. The HPCI System permits the nuclear plant to be shut down, maintaining sufficient reactor vessel water inventory until the vessel is depressurized. The HPCI System continues to operate until reactor vessel pressure is below the pressure at which either LPCI or CS operation can maintain core cooling. In this manner, the HPCI System provides a means for cooling the core at high pressure for those break sizes which are of such a magnitude that, because of a lack of vessel depressurization, the top of the core would become uncovered before the low pressure standby cooling systems were effective.

The HPCI System has components which function as part of the RCPB. The system has components that form part of the Primary Containment Isolation System. Instrumentation and control circuits in the HPCI System activate protective actions and support post-accident monitoring of safety related systems. The HPCI System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. Also, the HPCI System is credited with safe shutdown following a fire and for compliance with SBO and EQ requirements.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment and non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The HPCI System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,
2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,
3. Components that are relied on during postulated fires and station blackout events,
4. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The HPCI System is described in Section 6.3.2 of the BSEP UFSAR.

The License Renewal scoping boundaries for the HPCI System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25023-LR, Sheet 1, 2	D-02523-LR, Sheet 1, 2	None

Components Subject to AMR

The table below identifies the HPCI System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.2.2-3 Engineered Safety Features - Summary of Aging Management Evaluation – High Pressure Coolant Injection (HPCI) System.

TABLE 2.3.2-3 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: HIGH PRESSURE COOLANT INJECTION SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (High Pressure Coolant Injection (HPCI) System)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Piping and Fittings (Steam Line to HPCI and RCIC Pump Turbine)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1 Provide pressure-retaining boundary
Valves (Body)	M-1 Provide pressure-retaining boundary

TABLE 2.3.2-3 (continued) COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: HIGH PRESSURE COOLANT INJECTION SYSTEM

Piping and Fittings (High Pressure Coolant Injection (HPCI))	M-1 Provide pressure-retaining boundary
Piping and Fittings (Lines to Suppression Chamber (SC))	M-1 Provide pressure-retaining boundary
Piping and Fittings (Lines to HPCI and RCIC Pump Turbine)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Lines from HPCI and RCIC Pump Turbines to Torus or Wetwell)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Piping specialties)	M-1 Provide pressure-retaining boundary M-2 Provide filtration M-6 Provide insulation/thermal resistance
Piping and Fittings (Misc. auxiliary and drain piping and valves)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Piping and Fittings (restrictive orifices/flow elements)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Bowl/Casing)	M-1 Provide pressure-retaining boundary
Pumps (HPCS or HPCI Main and Booster, LPCS LPCI or RHR, and RCIC) (Suction Head)	M-1 Provide pressure-retaining boundary
Pumps (HPCS or HPCI Main and Booster, LPCS LPCI or RHR, and RCIC) (Discharge Head)	M-1 Provide pressure-retaining boundary
Valves (Check, Control, Hand, Motor Operated, and Relief Valves) (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Emergency Core Cooling System (BWR) (Auxiliary Pumps)	M-1 Provide pressure-retaining boundary
Emergency Core Cooling System (BWR) (Misc. Tanks and Vessels)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Emergency Core Cooling System (BWR) (Steam Turbines)	M-1 Provide pressure-retaining boundary
Auxiliary Heat Exchangers (Auxiliary Heat Exchanger tubing)	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Auxiliary Heat Exchangers (Auxiliary Heat Exchanger shell / housing)	M-1 Provide pressure-retaining boundary
Auxiliary Strainers/Filters (Auxiliary Strainer Element)	M-2 Provide filtration
Auxiliary Strainers/Filters (Auxiliary Strainer Housing)	M-1 Provide pressure-retaining boundary
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers)	M-1 Provide pressure-retaining boundary M-2 Provide filtration

2.3.2.5 Automatic Depressurization System (ADS)

System Description

The ADS provides automatic nuclear system depressurization for small and intermediate breaks so that RHR Low Pressure Coolant Injection (LPCI) and the Core Spray (CS) system can operate when the HPCI System has not been able to accomplish its function. The relief capacity of the ADS is based on the time required after its initiation to depressurize the nuclear system so that the core can be cooled by LPCI and the CS system. The ADS uses seven of the nuclear system safety relief valves (SRVs) to relieve high pressure steam to the suppression pool. In support of the ADS function, the SRVs open automatically, after a time delay, upon coincident signals of reactor vessel low water level and discharge pressure indication of the availability of any low pressure cooling system (LPSI or CS). In fulfilling its ESF function, the ADS provides output signals to automatically open designated safety-relief valves.

ADS instrumentation and control circuits activate protective actions and support post-accident monitoring of safety related systems. The ADS contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. In addition, the ADS is credited with safe shutdown following a fire, with SBO coping, and for compliance with EQ requirements. The majority of ADS components are addressed as electrical and I&C component/ commodities in Section 2.5. However, solenoid operated valves used to actuate the SRVs have a pressure boundary function.

The ADS is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events,

4. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The ADS is described in Section 6.3.2 of the BSEP UFSAR.

The ADS actuates pilot solenoid valves that, in turn, direct instrument air pressure to actuate the SRVs. The solenoid valves and SRVs are shown on License Renewal boundary drawings for the Reactor Vessel and Internals System and for the Instrument Air System.

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25021-LR, Sheet 1A, 1B	D-02521-LR, Sheet 1A, 1B	None

Components Subject to AMR

The table below identifies the ADS components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.2.2-4 Engineered Safety Features - Summary of Aging Management Evaluation – Automatic Depressurization System (ADS).

TABLE 2.3.2-4 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: AUTOMATIC DEPRESSURIZATION SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1 Provide pressure-retaining boundary

2.3.2.6 Core Spray (CS) System

System Description

The CS System is provided to protect the core by removing decay heat following the postulated design basis LOCA. The CS System provides adequate cooling for all intermediate and large line break LOCAs without assistance from any other core standby cooling system. The protection provided by the CS System also extends to a small break in which the control rod drive water pumps, the RCIC System, and the HPCI System all are unable to maintain the reactor vessel water level; but the ADS has operated to reduce the reactor vessel pressure such that LPCI and the CS Systems can provide core cooling.

The CS System consists of two independent loops. Each loop includes one 100% capacity centrifugal pump driven by an electric motor, a spray sparger in the reactor vessel above the core, piping and valves that convey water from the suppression pool to the sparger, and associated instrumentation and controls.

Actuation of the CS System results from low water level in the reactor vessel or coincident high pressure in the Drywell and low reactor pressure signals. Following system actuation and when reactor vessel pressure is low enough, water is pumped from the suppression pool and sprayed onto the top of the fuel assemblies. Flow passes through a normally open, motor-operated gate valve, located as close to the suppression pool as possible, which can be closed by a remote-manual switch from the Control Room. Closure isolates the system from the suppression pool in the case of CS System leakage.

One check valve and one motor operated valve in each loop isolate the CS System from the nuclear system when the CS pump is not running. A second motor operated valve is normally open outboard of the primary containment isolation valve.

Portions of the CS System support the integrity of the RCPB. CS System lines penetrate the Primary Containment, and portions of the system perform the containment isolation function. Instrumentation and control circuits activate protective actions and permissive interlocks and support post-accident monitoring of safety related systems. The CS System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. In addition, the CS System is credited for compliance with SBO and EQ requirements.

The System contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment and non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The CS System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events,

4. Components that are part of the Environmental Qualification Program.

<u>UFSAR and Drawing References</u>

The CS System is described in detail Section 6.3.2 of the BSEP UFSAR.

The License Renewal scoping boundaries for the CS System are shown on the following License Renewal boundary drawing. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25024-LR, Sheet 1, 2	D-02524-LR, Sheet 1, 2	None

Components Subject to AMR

The table below identifies the CS System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.2.2-5 Engineered Safety Features - Summary of Aging Management Evaluation – Core Spray (CS) System.

TABLE 2.3.2-5 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: CORE SPRAY SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Low Pressure Core Spray(LPCS) System)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1 Provide pressure-retaining boundary
Valves (Body)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Piping and Fittings (Low-Pressure Core Spray(LPCS))	M-1 Provide pressure-retaining boundary
Piping and Fittings (Lines to Suppression Chamber (SC))	M-1 Provide pressure-retaining boundary
Piping and Fittings (Piping specialties)	M-4 Provide structural support/seismic integrity
Piping and Fittings (Misc. auxiliary and drain piping and valves)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Piping and Fittings (restrictive orifices/flow elements)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Bowl/Casing)	M-1 Provide pressure-retaining boundary
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Suction Head)	M-1 Provide pressure-retaining boundary
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Discharge Head)	M-1 Provide pressure-retaining boundary
Valves (Check, Control, Hand, Motor Operated, and Relief Valves) (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers)	M-1 Provide pressure-retaining boundary M-2 Provide filtration

2.3.2.7 Standby Gas Treatment System (SGTS)

<u>System Description</u>

The SGTS provides a means for minimizing the release of radioactive material to the environs by filtering and exhausting the atmosphere from the primary or secondary containment during containment isolation conditions. The suction of the system normally is aligned to draw from the Reactor Building at elevation 50 ft into which all areas of the Reactor Building communicate. Elevated release is assured by exhausting to the plant stack. Normally closed suction valves are provided in the flow paths from the Drywell and the suppression pool to the SGTS. These valves can be opened only upon operator action. The principal functions of the system are: 1) to maintain secondary containment below atmospheric pressure when it is contaminated, for example following a fuel handling accident, 2) to clean up a contaminated Drywell or suppression chamber atmosphere when they are being vented to the atmosphere, 3) to provide a filtered pathway when venting the Drywell during nitrogen inerting following a LOCA, and 4) to assist in controlling hydrogen stratification in the Reactor Building following a LOCA.

The basic system, for each BSEP Unit, consists of a suction duct that can be aligned to primary or secondary containment, two parallel filter trains and blowers, and a discharge vent. Each of the two SGTS filter trains contains a moisture separator and a heater to provide humidity control, banks of particulate and charcoal filters to remove particulates and halogens, and a blower. Each blower is aligned with a particular filter train. The filter trains and blowers are located in the standby gas treatment (SGT) area which is on Elevation 50 ft of each Reactor Building. The SGTS discharge vents direct flow via an underground pipe to the 100 meter high plant stack and then to the atmosphere.

The SGTS, as a part of the Secondary Containment isolation system, limits the release of radioactivity to the environs after an accident. The system provides a back-up means of controlling post-LOCA hydrogen inside Primary Containment by venting of the Primary Containment through the SGTS. SGTS instrumentation and control circuits actuate ESF functions and support post-accident monitoring of safety related systems.

In addition, to its safety related components, the SGTS contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. Also, the SGTS is credited for compliance with fire protection and EQ requirements.

The system contains non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The SGTS is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires,

4. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The SGTS is described in detail in Section 6.5.1 of the BSEP UFSAR.

The License Renewal scoping boundaries for the SGTS are shown on the following License Renewal boundary drawing. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
F-40073-LR, Sheet 3	F-04073-LR, Sheet 3	D-04104-LR
		F-02314-LR

Components Subject to AMR

The table below identifies the SGTS components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.2.2-6 Engineered Safety Features - Summary of Aging Management Evaluation – Standby Gas Treatment System (SGTS) System.

TABLE 2.3.2-6 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: STANDBY GAS TREATMENT SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Ductwork (Equipment Frames and Housing)	M-1 Provide pressure-retaining boundary
Filters (Housing and Supports)	M-1 Provide pressure-retaining boundary
Filters (Elastomer Seals)	M-1 Provide pressure-retaining boundary
Standby Gas Treatment System (Boiling Water Reactor) (Piping)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Standby Gas Treatment System (Boiling Water Reactor) (Valves)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity

TABLE 2.3.2-6 (continued) COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: STANDBY GAS TREATMENT SYSTEM

Standby Gas Treatment System (Boiling Water Reactor) (Piping Specialties)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction M-4 Provide structural support/seismic integrity
Standby Gas Treatment System (Boiling Water Reactor) (Instrument Tubing)	M-1 Provide pressure-retaining boundary

2.3.2.8 Standby Liquid Control (SLC) System

System Description

The SLC System provides a backup method, independent of the control rods, to establish and maintain the reactor subcritical as the nuclear system cools. Maintaining the nuclear system in a subcritical condition as it cools assures that the fuel barrier will not be threatened by overheating in the unlikely event that too few control rods can be inserted to counteract the positive reactivity effects of a colder moderator. Insertion of control rods is always expected to assure prompt shutdown of the reactor should it be required. However, the SLC System can be manually initiated from the control room to pump a neutron absorber solution of sodium pentaborate into the reactor if the operator believes the reactor cannot be shut down or kept shut down with the control rods. The boron in the solution absorbs thermal neutrons and thereby terminates the nuclear fission chain reaction. The boron solution is piped into the reactor vessel and discharged near the bottom of the core shroud so it mixes with the cooling water rising through the core.

The boron solution storage tank, redundant electric motor-driven, positive displacement pumps, redundant explosive-actuated valves, and associated local valves and controls are mounted in the Reactor Building outside the primary containment. Only one of the two stand-by liquid control pumps and one of the two explosive valves are needed for proper system operation. The two explosive-actuated injection valves provide high assurance of opening when needed and ensure that boron will not leak into the reactor even when the pumps are being tested.

The SLC System is credited in Alternative Source Term (AST) evaluations with post-LOCA pH control in the suppression pool in order to maintain iodine in solution. The flow path to the suppression pool is into the vessel through the normal SLC injection path, out the postulated break into the Drywell, and then into the suppression pool.

Portions of the SLC System support the integrity of the RCPB. In addition, SLC System discharge line penetrates Primary Containment, and components of the system perform the containment isolation function. The SLC System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The SLC System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated anticipated transients without scram.

UFSAR and Drawing References

The SLC System is described in detail Section 9.3.4 of the BSEP UFSAR.

The License Renewal scoping boundaries for the SLC System are shown on the following License Renewal boundary drawing. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25047-LR	D-02547-LR	None

Components Subject to AMR

The table below identifies the SLC System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.2.2-7 Engineered Safety Features - Summary of Aging Management Evaluation – Standby Liquid Control (SLC) System.

TABLE 2.3.2-7 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: STANDBY LIQUID CONTROL SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Lines to Reactor Water Cleanup (RWC) and Standby Liquid Control (SLC) Systems)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1 Provide pressure-retaining boundary
Valves (Body)	M-1 Provide pressure-retaining boundary
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Piping (Piping specialties)	M-1 Provide pressure-retaining boundary
Solution Storage (Tank)	M-1 Provide pressure-retaining boundary
Valves (Pump Suction, Relief, Injection, Containment Isolation, and Explosive Actuated Discharge) (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Injection Pumps (Casing)	M-1 Provide pressure-retaining boundary
Standby Liquid Control System (Boiling Water Reactor) (Hydraulic Accumulator Tank)	M-1 Provide pressure-retaining boundary

2.3.2.9 HVAC Control Building System

System Description

The HVAC Control Building System is designed to permit continuous occupancy of the control room area, computer rooms and the electronic workrooms (this multi-room area is also called the control room envelope or emergency zone) under normal operating and postulated design basis accident conditions throughout the life of the plant. The system is designed to ensure optimum habitability and temperature conditions exist within the various Control Building areas for the safety of plant personnel and equipment. The HVAC Control Building System permits continuous occupancy of the control room emergency zone under normal and postulated design basis accident conditions, including a postulated LOCA, MSLB accident, or release of chlorine gas or smoke. The system permits access and occupancy of the control room under accident conditions without personnel receiving excessive radiation exposure.

The HVAC Control Building System consists of individual once-through ventilation systems, a recirculating air-conditioned control room normal ventilation system, and a control room emergency ventilation system. Each cable spreading room, each battery room, and the mechanical equipment room are provided with a once-through ventilation system equipped with an individual supply fan and exhaust fan. Battery rooms are ventilated to prevent accumulation of an explosive mixture of hydrogen gas released from the plant batteries. The recirculating air-conditioned control room normal ventilation system provides air to the main control room and its associated areas. This multi-room area is maintained at a positive static pressure with respect to the rest of the building. When required, the control room emergency ventilation system provides the additional charcoal and HEPA filtering necessary to maintain habitable conditions within the control room area during emergency situations. Major equipment in this system includes supply and exhaust fans, air filters, HEPA and charcoal filters, cooling coils, room fan cooling units, ductwork, accessories and dampers.

The battery room ventilation system is designed to maintain the battery rooms between 65°F and 110°F throughout the year. Dampers in the system are adjusted to maintain a minimum flow rate required to prevent the build-up of hydrogen and to control battery room temperature.

HVAC Control Building System instrumentation and control circuits provide for manual actuation of ESF equipment when required. The HVAC Control Building System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. The system is credited with safe shutdown following a fire and compliance with SBO requirements.

The HVAC Control Building System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events.

<u>UFSAR and Drawing References</u>

The HVAC Control Building System design and operation are described in BSEP UFSAR Sections 6.4 and 9.4.1.

The License Renewal scoping boundaries for the HVAC Control Building System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
None	None	F-04080-LR, Sheet 1, 2

Components Subject to AMR

The table below identifies the HVAC Control Building System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.2.2-8 Engineered Safety Features - Summary of Aging Management Evaluation – HVAC Control Building System.

TABLE 2.3.2-8 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: HVAC CONTROL BUILDING SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Air Receiver (Shell and Access Cover)	M-1 Provide pressure-retaining boundary
Filter (Shell and Access Cover)	M-1 Provide pressure-retaining boundary
Dryer (Shell and Access Cover)	M-1 Provide pressure-retaining boundary
Duct (Duct Fittings, Access Doors, Damper Housings and Closure Bolts)	M-1 Provide pressure-retaining boundary
Duct (Equipment Frames and Housings, including Fan Housings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Duct (Flexible Collars between Ducts and Fans)	M-1 Provide pressure-retaining boundary
Duct (Seals in Dampers and Doors)	M-1 Provide pressure-retaining boundary
Air Handler Heating/Cooling (Heating/Cooling Coils)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity M-5 Provide heat transfer
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Filters (Housing and Supports)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Filters (Elastomer Seals)	M-1 Provide pressure-retaining boundary

2.3.2.10 Reactor Protection System

System Description

The Reactor Protection System (RPS) provides timely protection against the onset and consequences of conditions that are threats to the integrity of the fuel barriers (uranium dioxide sealed in cladding) and of the nuclear system process barrier. Excessive temperature tends to degrade the cladding and/or melt the uranium dioxide. Excessive pressure tends to rupture the nuclear system process barrier. The RPS limits the uncontrolled release of radioactive material from the fuel and nuclear system process barrier by initiating an automatic scram to terminate excessive temperature and pressure increases resulting from high reactor power.

The RPS includes the motor-generator sets and associated electrical protection assemblies, sensors, RPS cabinets and associated control logic circuitry that cause rapid insertion of control rods (scram) to shutdown the reactor. Also included are the buffered outputs to the process computer and plant annunciator systems. The sensors that are located within the RPS are the Drywell pressure transmitters and the turbine first stage pressure switches. Other sensors that provide signals to the RPS are located in other systems. The control rods, control rod drives, solenoid-operated pilot scram valves, and scram discharge volume are also located in other systems. Components in the RPS are credited with safe shutdown following postulated fires and SBO events. The majority of RPS components are addressed as electrical and I&C component/ commodities in Section 2.5. In addition, the system includes supports for safety related equipment; these are addressed, for scoping and screening, as structural commodities in Section 2.4. However, portions of the RPS provide a mechanical pressure boundary function in support of actuating safety related equipment and are addressed as mechanical components/ commodities.

The RPS is in the scope of License Renewal because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events

2. Components that are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions

3. Components that are relied on during postulated fires and station blackout events

4. Components that are part of the Environmental Qualification Program

<u>UFSAR and Drawing References</u>

The RPS is described in detail in UFSAR Section 7.2.

No License Renewal boundary drawings are provided for the RPS. Process system and other inputs to the RPS are shown on UFSAR Table 7-2.

<u>Components Subject to AMR</u>

The table below identifies the RPS components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.2.2-9 Engineered Safety Features - Summary of Aging Management Evaluation – Reactor Protection System.

TABLE 2.3.2-9 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR PROTECTION SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Engineered Safety Features (Misc. Non- GALL Components (Inside))	M-1 Provide pressure-retaining boundary

2.3.3 AUXILIARY SYSTEMS

Auxiliary Systems are those systems used to support normal and emergency plant operations. The systems provide cooling, ventilation, sampling and other required functions. The following systems are included in this Subsection:

1. Reactor Water Cleanup (RWCU) System (Subsection 2.3.3.1)
2. Reactor Core Isolation Cooling (RCIC) System (Subsection 2.3.3.2)
3. Reactor Building Sampling (RXS) System (Subsection 2.3.3.3)
4. Post Accident Sampling System (PASS) (Subsection 2.3.3.4)
5. Circulating Water (CW) System (Subsection 2.3.3.5)
6. Screen Wash Water (SCW) System (Subsection 2.3.3.6)
7. Service Water (SW) System (Subsection 2.3.3.7)
8. Reactor Building Closed Cooling Water (RBCCW) System (Subsection 2.3.3.8)
9. Turbine Building Closed Cooling Water (TBCCW) System (Subsection 2.3.3.9)
10. Diesel Generator (DG) System (Subsection 2.3.3.10)
11. Heat Tracing System (Subsection 2.3.3.11)
12. Instrument Air (IA) System (Subsection 2.3.3.12)
13. Service Air (SA) System (Subsection 2.3.3.13)
14. Pneumatic Nitrogen System (PNS) (Subsection 2.3.3.14)
15. Fire Protection (FP) System (Subsection 2.3.3.15)
16. Fuel Oil (FO) System (Subsection 2.3.3.16)
17. Radioactive Floor Drains System (Subsection 2.3.3.17)
18. Radioactive Equipment Drains System (Subsection 2.3.3.18)
19. Makeup Water Treatment System (MWTS) (Subsection 2.3.3.19)

20. Chlorination System (Subsection 2.3.3.20)

21. Potable Water System (PWS) (Subsection 2.3.3.21)

22. Process Radiation Monitoring (PRM) System (Subsection 2.3.3.22)

23. Area Radiation Monitoring (ARM) System (Subsection 2.3.3.23)

24. Liquid Waste Processing System (Subsection 2.3.3.24)

25. Spent Fuel System (Subsection 2.3.3.25)

26. Fuel Pool Cooling and Cleanup System (Subsection 2.3.3.26)

27. HVAC Diesel Generator Building (Subsection 2.3.3.27)

28. HVAC Reactor Building (Subsection 2.3.3.28)

29. HVAC Service Water Intake Structure (Subsection 2.3.3.29)

30. HVAC Turbine Building (Subsection 2.3.3.30)

31. HVAC Radwaste Building (Subsection 2.3.3.31)

32. Torus Drain System (Subsection 2.3.3.32)

33. Civil Structure Auxiliary Systems (Subsection 2.3.3.33)

34. Non-Contaminated Water Drainage System (Subsection 2.3.3.34)

2.3.3.1 Reactor Water Cleanup (RWCU) System

System Description

The RWCU System provides continuous purification of a portion of the reactor recirculation flow. The system can be operated at any time. The major equipment of this system, which is located in the Reactor Building, consists of pumps, heat exchangers (both regenerative and non-regenerative), two filter-demineralizers and the associated valves, piping, and instrumentation. Reactor coolant is removed from the reactor coolant recirculation system and is cooled in the regenerative and non-regenerative heat exchangers. After cooling, the circulated water is filtered and demineralized to reduce the amount of activated corrosion products in the water. It is then returned to the feedwater system through the shell side of the regenerative heat exchanger.

Purification of reactor coolant is not a License Renewal intended function. However, components in the RWCU System are credited with responding to design basis events. RWCU is isolated automatically upon initiation of the Standby Liquid Control System and upon detection of conditions that may indicate a pipe break in the RWCU System. These conditions are low reactor vessel water level, high differential flow in RWCU piping, and high room temperature.

Portions of the RWCU System support the integrity of the RCPB. RWCU System lines penetrate the Primary Containment, and portions of the system perform the containment isolation function. RWCU System instrumentation and control circuits activate protective actions and support post-accident monitoring of safety related systems. The System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. Also, the RWCU System is credited with SBO coping, and for compliance with EQ requirements. In addition, RWCU isolation is required to support Standby Liquid Control System operation for ATWS mitigation.

The System contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment and non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The RWCU System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated anticipated transients without scram and station blackout events,

4. Components that are part of the Environmental Qualification Program.

<u>UFSAR and Drawing References</u>

The RWCU System is described in detail in BSEP UFSAR Section 5.4.8.

The License Renewal scoping boundaries for the RWCU System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25027-LR, Sheet 1A, 1B	D-02527-LR, Sheet 1A, 1B	None
F-25028-LR, Sheet 2A	F-02528-LR, Sheet 2A	

Components Subject to AMR

The table below identifies the RWCU System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-1 Auxiliary Systems – Summary of Aging Management Evaluation – Reactor Water Cleanup (RWCU) System.

TABLE 2.3.3-1 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR WATER CLEANUP SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Lines to Reactor Water Cleanup (RWC) and Standby Liquid Control (SLC) Systems)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1 Provide pressure-retaining boundary
Valves (Body)	M-1 Provide pressure-retaining boundary
Piping (Piping and Fittings - Beyond Second Isolation Valves)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Regenerative Heat Exchanger (Shell and Access Cover)	M-4 Provide structural support/seismic integrity
Reactor Water Cleanup System (BWR) (Valves - Beyond Second Isolation Valves)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Reactor Water Cleanup System (BWR) (Tanks, Pumps, and Piping Specialties - Beyond Second Isolation Valves)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction M-4 Provide structural support/seismic integrity

2.3.3.2 Reactor Core Isolation Cooling (RCIC) System

System Description

The RCIC System consists of a steam driven turbine-pump unit and associated valves and piping capable of delivering makeup water to the reactor vessel. The steam supply to the turbine comes from the main steam line upstream of the isolation valves and exhausts to the suppression pool. The pump can take suction from the Condensate Storage Tank (CST) or from the suppression pool. The makeup water is delivered into the reactor vessel through a connection to the feedwater line and is distributed within the reactor vessel through the feedwater sparger. Cooling water for the RCIC system turbine lube oil cooler and gland seal condenser is supplied from the discharge of the pump.

The RCIC System operates automatically to maintain sufficient coolant in the reactor vessel to prevent overheating of the reactor fuel in the event of reactor isolation accompanied by loss of feedwater flow. The system functions in a timely manner so that integrity of the radioactive material barrier is not compromised. Automatic operation of the RCIC System is a transient response function and not a safety related function. However, components in the RCIC System are credited with responding to design basis events. The RCIC System is isolated automatically upon detection of conditions that may indicate a pipe break in the RCIC turbine steam supply.

Those portions of the RCIC System that comprise part of the RCPB and branch piping up to the second valve normally closed or capable of automatic closure are classified as safety-related. Portions of this system are used for primary containment isolation while other portions interface with the HPCI and RHR systems. RCIC System instrumentation and control circuits activate protective actions and support post-accident monitoring of safety related systems. Also, the RCIC System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. In addition, the RCIC System is credited with safe shutdown following a fire, with SBO coping, and for compliance with EQ requirements.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment and non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The RCIC System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events,

4. Components that are part of the Environmental Qualification Program.

<u>UFSAR and Drawing References</u>

The RCIC System is described in detail in BSEP UFSAR Sections 5.4.6 and 6.3.2.8.

The License Renewal scoping boundaries for the RCIC System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25029-LR, Sheet 1, 2	D-02529-LR, Sheet 1, 2	None

Components Subject to AMR

The table below identifies the RCIC System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-2 Auxiliary Systems – Summary of Aging Management Evaluation – Reactor Core Isolation Cooling (RCIC) System

TABLE 2.3.3-2 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR CORE ISOLATION COOLANT SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Reactor Core Isolation Cooling (RCIC) System)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Piping and Fittings (Steam Line to HPCI and RCIC Pump Turbine)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1 Provide pressure-retaining boundary
Valves (Body)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Reactor Core Isolation Cooling (RCIC))	M-1 Provide pressure-retaining boundary
Piping and Fittings (Lines to Suppression Chamber (SC))	M-1 Provide pressure-retaining boundary
Piping and Fittings (Lines to HPCI and RCIC Pump Turbine)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Lines from HPCI and RCIC Pump Turbines to Torus or Wetwell)	M-1 Provide pressure-retaining boundary
Piping and Fittings (Piping specialties)	M-1 Provide pressure-retaining boundary M-6 Provide insulation/thermal resistance
Piping and Fittings (Misc. auxiliary and drain piping and valves)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Piping and Fittings (restrictive orifices/flow elements)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Bowl/Casing)	M-1 Provide pressure-retaining boundary
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Suction Head)	M-1 Provide pressure-retaining boundary

TABLE 2.3.3-2 (continued) COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR CORE ISOLATION COOLANT SYSTEM

Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Discharge Head)	M-1 Provide pressure-retaining boundary
Valves (Check, Control, Hand, Motor Operated, and Relief Valves) (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Emergency Core Cooling System (BWR) (Auxiliary Pumps)	M-1 Provide pressure-retaining boundary
Emergency Core Cooling System (BWR) (Misc. Tanks and Vessels)	M-1 Provide pressure-retaining boundary
Emergency Core Cooling System (BWR) (Steam Turbines)	M-1 Provide pressure-retaining boundary
Auxiliary Heat Exchangers (Auxiliary Heat Exchanger tubing)	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Auxiliary Heat Exchangers (Auxiliary Heat Exchanger shell / housing)	M-1 Provide pressure-retaining boundary
Auxiliary Strainers/Filters (Auxiliary Strainer Housing)	M-1 Provide pressure-retaining boundary
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers)	M-1 Provide pressure-retaining boundary M-2 Provide filtration
Pressure Regulators (Body and Bonnet)	M-4 Provide structural support/seismic integrity

2.3.3.3 Reactor Building Sampling (RXS) System

System Description

The RXS System monitors the plant and equipment performance to determine routine chemical properties and radiation levels necessary to provide information for equipment operation, corrosion control, and radiation activity. The system also provides information for making operational decisions with regard to effectiveness, safety, and proper performance. Samples can be taken continuously or obtained as grab samples. There is one central sampling station that is essentially a package of sample conditioning and analyzing sections and a sample hood. Consideration of accessibility, safe withdrawal, and efficient handling of samples were factored into the design of the centralized sampling station.

The RXS System is not required for safe shutdown, nor is it required to mitigate the consequences of an accident. However, it does interface with safety-related systems, and thus, the sample lines that interface with safety-related systems are provided with solenoid operated isolation valves operated remotely from local instruments or from the control room panel. These valves are generally included under the interfacing systems and not the RXS system. The portions of these sample lines connecting to safety-related systems are also safety-related.

Portions of this system comprise part of the RCPB. Also, portions of this system are used for primary containment isolation. The RXS System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The RXS System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The RXS System is described in BSEP UFSAR Section 9.3.2.1.

The License Renewal scoping boundaries for the RXS System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-70070-LR, Sheet 1, 2	D-07070-LR, Sheet 1, 2	None

Components Subject to AMR

The table below identifies the RXS System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-3 Auxiliary Systems - Summary of Aging Management Evaluation – Reactor Building Sampling (RXS) System

TABLE 2.3.3-3 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR BUILDING SAMPLING SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Sample Lines)	M-1 Provide pressure-retaining boundary
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Shell and Access Cover)	M-1 Provide pressure-retaining boundary
Flow Orifice (Body)	M-1 Provide pressure-retaining boundary
Pump (Casing)	M-1 Provide pressure-retaining boundary
Filters (Shell and Access Cover)	M-1 Provide pressure-retaining boundary
Immersion Element (Pressure Retaining Housing)	M-1 Provide pressure-retaining boundary
Tank (Shell)	M-1 Provide pressure-retaining boundary

2.3.3.4 Post Accident Sampling System (PASS)

System Description

The PASS function is to obtain representative liquid samples from the primary coolant system and gas samples from primary and secondary containment for radiological analysis following an accident, including a LOCA. The basic system consists of a liquid and gas sample station located outside the Reactor Building in the Turbine Building breezeway. Each Unit has its own sampling system. Each sampling and control station is located near each Unit's Reactor Building personnel access doors. To meet the requirements of NUREG-0578, the design is intended to minimize radiation exposure during sampling by minimizing the required sample sizes, to optimize the weight of shielded sample containers in order to facilitate movement through potentially high-level radiation areas, and to provide adequate shielding at the sample station and in the laboratory. The system is also designed to provide useful samples under all conditions ranging from normal shutdown and power operation. A local area radiation monitor is provided to inform the operator of the ambient radiation level.

The portions of PASS within the scope of License Renewal consist of safety related (primarily for containment isolation and control of release of radioactive material), Environmentally Qualified (required to function in a post-accident environment) and seismically mounted (located in close proximity to safety related equipment) components located in the Turbine, Reactor, and Control Buildings. PASS instrumentation and control circuits support post-accident monitoring of safety related systems. The PASS contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. In addition, the PASS is credited for compliance with EQ requirements.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment and non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The PASS is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The PASS is described in BSEP UFSAR Section 9.3.2.2.

The License Renewal scoping boundaries for the PASS are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-73027-LR, Sheet 1	D-07327-LR, Sheet 1	None

Components Subject to AMR

The table below identifies the PASS components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-4 Auxiliary Systems – Summary of Aging Management Evaluation – Post-Accident Sampling System (PASS).

TABLE 2.3.3-4 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: POST ACCIDENT SAMPLING SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Shell and Access Cover)	M-1 Provide pressure-retaining boundary

2.3.3.5 Circulating Water (CW) System

System Description

The purpose of the CW System is to provide the heat sink necessary to remove the latent heat of condensation from the exhaust steam of the low pressure turbines and to cool the condensate sufficiently to prevent cavitation in the condensate system, thus maintaining the vacuum required for operation. The system also provides dilution flow necessary for acceptable radioactive liquid effluent release concentrations.

The CW System is designed to supply a continuous flow of cooling water to the main condensing system to remove heat rejected from the steam power cycle. The CW System takes suction from the Cape Fear River estuary and provides cooling water through the main condensers, which then is discharged to the ocean. The CW System also dilutes the liquid waste flow prior to its release to the environment. The CW System is not required to function in order to shutdown the reactor or maintain it in a safe shutdown condition. Some electrical components in the system are classified as seismically analyzed to avoid adverse interactions with safety related SSCs during an earthquake.

The CW System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The CW System is described in BSEP UFSAR Section 10.4.5.

The CW System components that are in scope for License Renewal are electrical and I&C components mounted on control boards. Therefore, no License Renewal boundary drawings are provided.

Components Subject to AMR

The CW System components that are subject to AMR are addressed as civil commodities in Section 2.4.

2.3.3.6 Screen Wash Water (SCW) System

System Description

The SCW System consists of twelve traveling screens, four screen wash pumps, and four self-cleaning strainers. This system provides filtering capabilities for the Circulating Water and Service Water Systems of both units. Intake Canal water enters the Service Water Intake Structure through trash racks mounted across the inlet bays. Large debris is stopped by the trash racks and accumulates on the upstream face. The traveling screens at the individual pump bays remove the smaller debris and refuse that enters the intake structure.

The SCW System is not required for safe shutdown of the unit and does not provide any essential auxiliary service. The four traveling screens associated with the Service Water System, the SCW pumps, self-cleaning strainers and associated SCW System piping and fittings were determined to be in scope. However the screens are active components and, therefore, do not require an aging management review.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The SCW System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The SCW System is described in BSEP UFSAR Section 9.2.1.2.

The License Renewal scoping boundaries for the SCW System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-20042-LR	D-02042-LR	None

Components Subject to AMR

The table below identifies the SCW System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-5 Auxiliary Systems – Summary of Aging Management Evaluation – Screen Wash Water (SCW) System.

TABLE 2.3.3-5 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: SCREEN WASH WATER SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Pump (Casing)	M-1 Provide pressure-retaining boundary
Strainer (Body)	M-1 Provide pressure-retaining boundary

2.3.3.7 Service Water (SW) System

System Description

The SW System provides water from the Cape Fear River for lubrication and cooling of equipment in the Reactor Building, Turbine Building, Diesel Generator Building, and the Circulating Water System, and for dilution flow in the Chlorination System. Service water can also be cross-connected to the Residual Heat Removal System, in an emergency, to provide reactor core flooding capability.

The SW System is required to operate following a design basis event in order to provide cooling water to the diesel generators and to the RHR system for LPCI cooling and to limit suppression pool temperature during operation of HPCI and RCIC systems. The system also provides cooling water to the Core Spray pump room and RHR pump room coolers.

The SW System is subdivided into two major portions, one basically for nuclear and vital loads and the other normally for conventional loads in the Turbine Building. The two portions of the system are normally operated independently, each consisting of a group of service water pumps, parallel loads, and interconnecting headers. Suitable cross-connecting valves and piping are provided to permit use of the conventional system as a backup supply for Reactor Building cooling loads. Backup for diesel generator cooling is provided by the nuclear headers of each unit or by cross connecting conventional header pumps to the nuclear header.

SW System instrumentation and control circuits activate protective actions following postulated accidents and transients and support post-accident monitoring of SW System flow rate. The SW System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. The non-safety related portion of the SW System is required to maintain a flow path from each Reactor Building to the CW System discharge weir on the west side of the Turbine Building. In addition, the SW System is credited with safe shutdown following a fire, and components in the system are environmentally qualified to function in harsh environment areas.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The SW System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires,

4. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The SW System is described in BSEP UFSAR Section 9.2.1.

The License Renewal scoping boundaries for the SW System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-20041-LR, Sheet 1, 2	D-02041-LR, Sheet 1, 2	D-02274-LR, Sheet 1, 2
D-25037-LR, Sheet 1, 2	D-02537-LR, Sheet 1, 2	
D-20034-LR, Sheet 2	D-02034-LR, Sheet 1	

Components Subject to AMR

The table below identifies the SW System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-6 Auxiliary Systems - Summary of Aging Management Evaluation – Service Water (SW) System.

TABLE 2.3.3-6 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: SERVICE WATER (SW) SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Piping (Underground Piping and Fittings)	M-1 Provide pressure-retaining boundary
Piping (Piping Specialties)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Service Water Pump Motor Cooler Coils)	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Flow Orifice (Body)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Pump (Casing)	M-1 Provide pressure-retaining boundary
Basket Strainer (Body)	M-1 Provide pressure-retaining boundary M-2 Provide filtration
CW Strainer (Body Only)	M-1 Provide pressure-retaining boundary

2.3.3.8 Reactor Building Closed Cooling Water (RBCCW) System

System Description

The RBCCW System removes heat from the reactor auxiliary systems and their related accessories during normal operation. The system also provides an additional barrier between contaminated systems and the service water discharged to the environment. Those portions of the system that are within the scope of License Renewal are located in the Drywell, Reactor Building, and Control Building.

The RBCCW System provides cooling for the following:

1. Non-regenerative Heat Exchangers
2. Reactor Coolant Recirculation System pump and motor coolers
3. Sump and Equipment Drain Tank coolers
4. Sample coolers
5. Cleanup Recirculation Pump coolers
6. Cleanup pre-coat pump coolers
7. Fuel Pool Heat Exchangers
8. Drywell Coolers
9. Control Rod Drive Supply Pump coolers
10. Penetration Cooling System

The RBCCW System pumps, heat exchangers, and equipment required for normal system heat removal are designed to Class II requirements. To minimize potential damage from a pipe break and flooding to Class I equipment inside the Drywell, the portion of the system within the Drywell was designed to a higher level of quality and designated safety related. The Primary Containment isolation valves in the system and their controls and instrumentation are also classified safety-related. Those electrical RBCCW components that are located in a potentially harsh environment and required to perform a safety function are environmentally qualified. Certain non-safety related components have been seismically evaluated to assure their function during and following an earthquake, and those components that are located in close proximity to safety related equipment are seismically qualified to prevent undesirable interactions with safety related SSCs. The system is not required to operate after a design basis accident and may be isolated.

RBCCW System instrumentation and control circuits activate protective actions following postulated accidents and transients, and system indicating circuits support post-accident monitoring functions, such as containment isolation valve position.

The RBCCW System contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The RBCCW System provides the cooling water for the Penetration Cooling System. The Penetration Cooling System serves to cool piping penetration seals for pipes that have high temperature fluids traveling through them during operation. These penetrations include: Main Steam, Feedwater, HPCI, RCIC, Core Spray, RHR Shutdown Cooling suction, and RWCU. Uncooled penetrations carrying high temperature water could, over time, result in degradation of the concrete surrounding the penetrations. For License Renewal, the Penetration Cooling System is considered a subsystem of the RBCCW System.

The RBCCW System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are part of the Environmental Qualification Program.

<u>UFSAR and Drawing References</u>

The RBCCW System is described in BSEP UFSAR Section 9.2.2.

The License Renewal scoping boundaries for the RBCCW System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25038-LR, Sheet 1, 2	D-02538-LR, Sheet 1, 2	None
D-25041-LR	D-02541-LR	

Components Subject to AMR

The table below identifies the RBCCW System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-7 Auxiliary Systems – Summary of Aging Management Evaluation – Reactor Building Closed Cooling Water (RBCCW) System.

TABLE 2.3.3-7 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR BUILDING CLOSED COOLING WATER SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Reactor Building Closed Cooling Water System	
Piping (Pipe, Fittings, and Flanges)	M-1 Provide pressure-retaining boundary
Piping (Piping Specialties)	M-1 Provide pressure-retaining boundary
Valves (Check, Hand, Control, Relief, Solenoid, and Containment Isolation) (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Pump (Casing)	M-1 Provide pressure-retaining boundary
Tank (Shell)	M-1 Provide pressure-retaining boundary
Flow Orifice (Body)	M-1 Provide pressure-retaining boundary
Closed-Cycle Cooling Water System (Strainers)	M-1 Provide pressure-retaining boundary
Closed-Cycle Cooling Water System (Heat Exchangers)	M-1 Provide pressure-retaining boundary
Closed-Cycle Cooling Water System (Piping Specialties)	M-1 Provide pressure-retaining boundary
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Pressure Regulators (Body and Bonnet)	M-1 Provide pressure-retaining boundary

TABLE 2.3.3-7 (continued) COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR BUILDING CLOSED COOLING WATER SYSTEM

Penetration Cooling System	
Piping (Pipe, Fittings, and Flanges)	M-1 Provide pressure-retaining boundary
Valves (Check, Hand, Control, Relief, Solenoid, and Containment Isolation) (Body and Bonnet)	M-1 Provide pressure-retaining boundary

2.3.3.9 Turbine Building Closed Cooling Water (TBCCW) System

System Description

The TBCCW System is a closed loop system, which removes heat from the following secondary plant equipment and turbine-generator accessories:

1. Turbine-generator lube oil coolers
2. Turbine-generator electro-hydraulic control system coolers
3. Generator stator and rectifier coolers
4. Generator bus duct heat exchangers
5. Alterex exciter coolers
6. Generator hydrogen coolers
7. Air compressors and air aftercoolers
8. Turbine building sample coolers
9. Condenser mechanical vacuum pump coolers
10. Reactor feed pump turbine oil coolers
11. Recirculation pump motor-generator set oil coolers
12. Heater drain pump jacket and motor thrust bearings
13. Condensate pump motor thrust bearings
14. Condensate booster pump oil coolers

Each unit is provided with a TBCCW System consisting of two pumps, two heat exchangers and integrated piping. The systems utilize a common head tank. In addition, the Unit 2 TBCCW System is equipped with a chemical feed tank and a spare pump and heat exchanger. The spare pump and/or heat exchanger may be lined up to either unit's TBCCW System but not both. The TBCCW pumps that are arranged in parallel take suction from a common header and discharge to the heat exchangers. The heat exchangers are also arranged in parallel. The discharge from the heat exchangers is to a common supply header. The common supply header branches into smaller headers to supply groups of system loads. The returns from the system loads are combined into a common return header from which the pumps take suction.

All of the heat loads on the TBCCW System are non-safety-related. The TBCCW System is not required to function in order to shut down the reactor or to maintain it in a safe shutdown condition. Some electrical components in the system are classified as seismically analyzed to avoid adverse interactions with safety related SSCs during an earthquake.

The TBCCW System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The TBCCW System is described in BSEP UFSAR Section 9.2.7.

The TBCCW System components that are in scope for License Renewal are electrical and I&C components mounted on control boards. Therefore, no License Renewal boundary drawings are provided.

Components Subject to AMR

The TBCCW System components that are subject to AMR are addressed as civil commodities in Section 2.4.

2.3.3.10 Diesel Generator (DG) System

System Description

The DG System provides emergency AC power to the onsite electrical distribution system of each unit. The DG System contains four emergency diesel generator sets and is used to ensure that a supply of electrical power is available for the operation of safety-related equipment in the event of loss of offsite power. Electrical equipment and controls that are required to start and load the diesel, or prevent it from operating are classified safety-related. Diesel capacity is such that any three of the four diesels provided can supply all required loads for the safe shutdown of one unit and a design basis accident on the other unit without offsite power. During a Station Blackout (SBO) event, diesel capacity is such that one operational diesel can supply the required loads for safe shutdown of the non-blacked-out unit and the required SBO coping loads in the blacked-out unit.

The DG System provides the AC power required by the Class 1E distribution system to provide power for emergency systems and Engineered Safety Features during and following the shutdown of the reactor when the preferred power supply is not available. The system starts automatically on loss of voltage to its associated buses or on an ESF actuation signal on either Unit or on a loss of offsite power or a Unit trip of either Unit.

In addition, the emergency diesels may function as a source of electrical power during a shutdown following a fire or during an SBO event.

Support systems necessary to ensure proper operation of the DGs are:

1. Diesel Fuel Oil System
2. Diesel Lube Oil System
3. Diesel Jacket Water System
4. DG Service Water System
5. DG Starting Air System
6. DG Intake/Exhaust System

The Diesel Fuel Oil System stores and distributes fuel oil for use by the DGs. The system contains four 4-Day Fuel Oil Storage Tanks, one for each DG, in a four compartment underground vault; eight Fuel Oil Transfer Pumps, two for each 4-Day Tank; and four integral (Saddle) tanks, one tank attached to each DG. The system safety function is to provide fuel for operation of the emergency diesel generator sets.

The Diesel Lube Oil System is a closed loop system that lubricates various DG components and rejects heat to the lube oil cooling subsystem. For each DG, the system provides an engine-driven and a motor-driven circulating pump, a motor-driven pre-lube pump, strainers, heaters, LO cooler, and associated piping and valves. The system safety function is to provide lubrication for the emergency diesel generator sets.

The Diesel Jacket Water System is a closed loop system that removes most of the heat generated by the DG during operation by cooling the engine components and DG lubricating oil. The system contains an engine-driven circulation pump, expansion tank, jacket water cooler, LO cooler, combustion air intercooler, thermostatic valves, and piping and instrumentation. The system safety function is to provide cooling for the emergency diesel engines and auxiliaries.

The DG Service Water System contains redundant SW supply lines to remove heat from each DG jacket water cooler; if the normal supply is not available, the alternate supply line valve will open and the normal supply valve will close. The system also contains motor-operated valves that isolate the service water flow to a DG should a leak develop in the DG room. The system safety function is to provide cooling for the emergency diesel engines and auxiliaries.

The DG Starting Air System provides compressed air to the diesel engine cylinders for starting the emergency DGs and supplies air to DG instrumentation and controls. The system contains air compressors, two receiver tanks for each DG, and associated filters, valves, and piping. Each diesel is provided with two air-cooled, motor-driven starting air compressors each supplying an independent air receiver. Engine starting is accomplished by direct injection of the starting air into the engine cylinders through timing sequence valves. Each receiver is capable of starting its associated DG. The system safety function is to provide compressed air for starting the emergency diesel engines and for DG instrumentation and controls.

The DG Intake/Exhaust System provides combustion air to each DG and removes exhaust gases and potentially explosive fumes from each DG. The system contains three subsystems: the combustion air intake subsystem (including intake air filter, silencer, and turbocharger), the combustion exhaust subsystem (including exhaust gas turbine and silencer), and the crankcase vacuum subsystem (including oil filter/separator and air blower). The DG exhaust silencers are located on the DG Building roof. After passing through the silencers, exhaust gases are routed away from DG Building structures and do not impinge on any structures that could fall and block the DG exhaust flow path. Components in the system are seismically designed to assure their function during and following an earthquake. The system safety function is to support operation of the emergency diesel engines by supplying combustion air and exhausting combustion gases and crankcase vapors.

The DG and auxiliary systems contain non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment or to assure its function during and following an earthquake. In addition, the Diesel Fuel Oil, Lube Oil, and DGSW systems contain non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review. Also, the DG Starting Air System contains non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The DG System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events.

UFSAR and Drawing References

The DG System is described in BSEP UFSAR Section 8.3.1.1.6.

The License Renewal scoping boundaries for the DG System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.) Within the DG System, the Diesel Generator itself has no License Renewal boundary drawings.

BSEP Unit 1	BSEP Unit 2	BSEP Common
Diesel Fuel Oil System		
None	None	D-02268-LR, Sheet 1A, 1B
		D-02269-LR, Sheet 2A, 2B
Diesel Lube Oil System		
None	None	D-02270-LR, Sheet 1A, 1B
		D-02271-LR, Sheet 2A, 2B
Diesel Jacket Water System		
None	None	D-02272-LR, Sheet 1A, 1B
		D-02273-LR, Sheet 2A, 2B
DG Service Water System		
None	None	D-02274-LR, Sheet 1, 2
DG Starting Air System		
None	None	D-02265-LR, Sheet 1A, 1B
		D-02266-LR, Sheet 2A, 2B
DG Intake/Exhaust System		
None	None	D-02267-LR, Sheet 1, 2

Components Subject to AMR

The table below identifies the DG System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-8 Auxiliary Systems - Summary of Aging Management Evaluation – Diesel Generator (DG) System.

TABLE 2.3.3-8 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: DIESEL GENERATOR SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Diesel Generator	
Valves, Connected Pipe, Tubing & Fittings	M-1 Provide pressure-retaining boundary
Diesel Fuel Oil	
Piping (Aboveground Pipe and Fittings)	M-1 Provide pressure-retaining boundary
Piping (Underground Pipe and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary

TABLE 2.3.3-8 (continued) COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: DIESEL GENERATOR SYSTEM

Diesel Fuel Oil (continued)	
Pump (Casing)	M-1 Provide pressure-retaining boundary
Tank (Internal/External Surface)	M-1 Provide pressure-retaining boundary
Immersion Element (Pressure Retaining Housing)	M-1 Provide pressure-retaining boundary
Strainer (Body)	M-1 Provide pressure-retaining boundary
Tanks (Day and Drip)	M-1 Provide pressure-retaining boundary
Filters (Shell)	M-1 Provide pressure-retaining boundary
Diesel Lube Oil System	
Valves, Connected Pipe, Tubing & Fittings	M-1 Provide pressure-retaining boundary
Heaters & Thermowells (Housing)	M-1 Provide pressure-retaining boundary
Filter (Shell)	M-1 Provide pressure-retaining boundary
Pump (Casing)	M-1 Provide pressure-retaining boundary
Gauge Glass	M-1 Provide pressure-retaining boundary
Heat Exchanger (Tubes)	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Heat Exchanger (Shell)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Tube Sheet & Channel Head)	M-1 Provide pressure-retaining boundary
Strainer (Casing)	M-1 Provide pressure-retaining boundary
Strainer (Screen)	M-2 Provide filtration
Diesel Jacket Water System	
Heat Exchanger (Shell)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Channel)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Channel Head and Access Cover)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Tubesheet)	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Heat Exchanger (Tubes)	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Piping (Pipe, Fittings, and Flanges)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Valves (Check, Hand, Control, Relief, Solenoid, and Containment Isolation) (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Closed-Cycle Cooling Water System (Piping Specialties)	M-1 Provide pressure-retaining boundary
Diesel Engine Cooling Water Subsystem (Pipe and Fittings)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction M-4 Provide structural support/seismic integrity
Diesel Engine Cooling Water Subsystem (Tanks and Vessels)	M-1 Provide pressure-retaining boundary

TABLE 2.3.3-8 (continued) COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: DIESEL GENERATOR SYSTEM

Diesel Jacket Water (continued)	
Diesel Engine Cooling Water Subsystem (Heat Exchangers)	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Diesel Engine Cooling Water Subsystem (Pumps)	M-1 Provide pressure-retaining boundary
Diesel Engine Cooling Water Subsystem (Piping Specialties)	M-1 Provide pressure-retaining boundary
DG Service Water System	
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Piping (Piping Specialties)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
DG Starting Air System	
Pipe and Fittings	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Valves (Hand and Check)	M-1 Provide pressure-retaining boundary
Drain Trap	M-1 Provide pressure-retaining boundary
Air Accumulator Vessel	M-1 Provide pressure-retaining boundary
Filter (Shell)	M-1 Provide pressure-retaining boundary
Strainer (Shell)	M-1 Provide pressure-retaining boundary
Strainer (Basket)	M-2 Provide filtration
DG Intake/Exhaust System	
Piping and Fittings	M-1 Provide pressure-retaining boundary
Filter	M-1 Provide pressure-retaining boundary
Muffler (Intake Silencer)	M-1 Provide pressure-retaining boundary
Turbo Charger (inlet-housing)	M-1 Provide pressure-retaining boundary
Valve (Body), connected piping, tubing and fittings	M-1 Provide pressure-retaining boundary
Turbo Charger (inlet-bellows)	M-1 Provide pressure-retaining boundary
Filter (media)	M-2 Provide filtration
Piping and Fittings	M-1 Provide pressure-retaining boundary
Muffler (Exhaust)	M-4 Provide structural support/seismic integrity
Fans (Housing)	M-1 Provide pressure-retaining boundary
Oil Separator (Housing)	M-1 Provide pressure-retaining boundary
Valve (body), Connected Pipe & Fittings	M-1 Provide pressure-retaining boundary
Turbo Charger (exhaust-housing)	M-1 Provide pressure-retaining boundary
Turbo Charger (exhaust-bellows)	M-1 Provide pressure-retaining boundary

2.3.3.11 Heat Tracing System

System Description

The original purpose of the Freeze Protection and Heat Tracing System was to provide a source of heat to prevent certain system piping from freezing and/or to maintain proper process system fluid temperatures. The system is no longer used for these purposes and its name has been changed to the Heat Tracing System. However, a steam line from the system supporting CAC System nitrogen vaporization is located in the vicinity of safety related equipment in the Augmented Offgas Building. Therefore, it was concluded that the system contains non-safety related components (steam piping and valve) that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The Heat Tracing System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The Heating Steam System is mentioned in Sections 10.4.8.1 and 3A-22 of the BSEP UFSAR.

The License Renewal scoping boundaries for the Heat Tracing (Heating Steam) System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
None	None	F-02586-LR, Sheet 1

Components Subject to AMR

The table below identifies the Heat Tracing System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-9 Auxiliary Systems – Summary of Aging Management Evaluation – Heat Tracing System.

TABLE 2.3.3-9 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: HEAT TRACING SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Steam Drains)	M-1 Provide pressure-retaining boundary
Valves (Check, Control, Hand, Motor Operated, Safety Valves) (Body and Bonnet)	M-1 Provide pressure-retaining boundary

2.3.3.12 Instrument Air (IA) System

<u>System Description</u>

The plant instrument air system provides instrument quality air to pneumatically operated instruments and controls throughout the plant. Instrument air consists of Interruptible Instrument Air and Non-Interruptible Instrument Air.

The Interruptible Instrument Air (IAI) System provides operating air to less vital pneumatic instruments and controls and is not essential to safe plant shutdown. Where the IAI supply header enters the RB, the identity of the system changes to “RIA.” The RIA subsystem supplies non-safety related loads in the Reactor Building (RB).

The Non-Interruptible Instrument Air (IAN) System is designed with the capability of supplying instrument air requirements in the RB required for plant safety during normal operation. Once the supply header enters the RB, the system identity changes to “RNA.” The RNA subsystem may supply Primary Containment Drywell pneumatic loads but only at low reactor power levels in order to assure an inert atmosphere in the Primary Containment when required. (During normal plant operation, pneumatic loads in the Primary Containment are supplied by the Pneumatic Nitrogen System, which is discussed in a later subsection.)

The Nitrogen Backup System (also designated RNA) provides an independent, safety-related pneumatic source to selected safety-related loads in the event of either a LOCA or the loss of the normal pneumatic supply. During a LOCA, the normal pneumatic supply lines to the Drywell are isolated. The Nitrogen Backup System operates during any design basis event and is therefore designed to Class I seismic requirements. Requirements for safety related loads are met during a design basis event by individual accumulators, nitrogen gas bottles, or loads designed to fail in the safe position on loss of pneumatic supply.

The Containment Atmospheric Dilution (CAD) System provides a backup to the instrument air header in the Augmented Off-Gas Building upon loss of instrument air for the CAD subsystem. The CAD System is discussed in Subsection 2.3.2.3.

Components in the IA System automatically actuate and monitor backup nitrogen supplies when required. Components in the IA System provide the Primary Containment isolation function following design basis events. IA System instrumentation and control circuits activate protective actions following postulated accidents and transients. System indicating circuits support post-accident monitoring functions, such as containment isolation valve position.

The System includes components that are environmentally qualified to function in harsh environment areas in accordance with the EQ Program. Also, components in the System are credited for safe shutdown following a fire or an SBO event and also support fire protection regulations by activating isolation dampers.

The IA System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment or to assure required functions during and following an earthquake. The System also contains non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The IA System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events,

4. Components that are part of the Environmental Qualification Program.

<u>UFSAR and Drawing References</u>

Plant compressed air systems are described in BSEP UFSAR Section 9.3.1.

The License Renewal scoping boundaries for the Instrument Air System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-70007-LR, Sheet 1	D-07007-LR, Sheet 1	F-02587-LR, Sheet 2
D-70029-LR, Sheet 2A, 2B	D-07029-LR, Sheet 2A, 2B	
D-70077-LR, Sheet 3A, 3B	D-07077-LR, Sheet 3A, 3B	
D-72006-LR, Sheet 4	D-07206-LR, Sheet 4	
D-72009-LR	D-07209-LR, Sheet 6	
D-73068-LR, Sheet 1	D-07368-LR	

Components Subject to AMR

The table below identifies the IA System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Instrument Air (IA) System.

TABLE 2.3.3-10 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: INSTRUMENT AIR SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Air Receiver (Shell and Access Cover)	M-1 Provide pressure-retaining boundary
Pressure Regulators (Body and Bonnet)	M-4 Provide structural support/seismic integrity
Filter (Shell and Access Cover)	M-1 Provide pressure-retaining boundary

2.3.3.13 Service Air (SA) System

System Description

The SA System provides compressed air from the service air header to selected auxiliary equipment and to service outlets throughout the plant. A manual cross-tie isolation valve and necessary piping connect the SA headers between Units for improved reliability.

The SA System has no safety-related functions other than containment isolation in any mode of operation as the system does not supply air to any component requiring air to perform a safety-related function. The containment isolation function is performed by a segment of piping that has been cut and capped inside and outside the containment wall. In addition, those portions of the system in close proximity to and which may adversely interact with safety related equipment are designed to limited seismic qualification requirements and are in scope. The supports for the piping prevent the occurrence of adverse spatial interactions. The containment piping penetration and supports for the piping with limited seismic design considerations are civil commodities, and aging management of them is performed as discussed in Section 2.4.

The SA System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The SA System is described in BSEP UFSAR Section 9.3.1.

The License Renewal scoping boundaries for the SA System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25042-LR	D-02542-LR	None

Components Subject to AMR

The SA System components that are subject to AMR are addressed as civil commodities in Section 2.4.

2.3.3.14 Pneumatic Nitrogen System

System Description

The PNS provides gaseous nitrogen to pneumatically operated components in the Drywell to prevent an increase in Drywell atmosphere oxygen concentration due to releases of air from valve operation and leakage. The nitrogen for PNS is provided from two cryogenic tanks, one for each Unit, located in the yard area southeast of Unit 2 Reactor Building. This system may be used as backup to service and instrument air.

The PNS, which is the normal pneumatic supply to the Drywell during plant operation, may be isolated at low power levels (including Unit shutdown) to allow personnel access to the Drywell. The PNS provides gaseous nitrogen needed for operation of the instrumentation and pneumatic controls in the Drywell during normal plant operation only; it has no safety-related function. Those portions of the system in close proximity to and which may interact with safety related equipment are designed to limited seismic qualification requirements to prevent undesirable interactions with safety related equipment.

The system contains non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The PNS is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The PNS is described in BSEP UFSAR Section 9.3.1.

The License Renewal scoping boundaries for the PNS are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
None	None	D-02494-LR, Sheet 1

Components Subject to AMR

The table below identifies the PNS components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation – Pneumatic Nitrogen System (PNS).

TABLE 2.3.3-11 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: PNEUMATIC NITROGEN SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-4 Provide structural support/seismic integrity
Valves (including check valves and containment isolation) (Body and Bonnet)	M-4 Provide structural support/seismic integrity
Filter (Shell and Access Cover)	M-4 Provide structural support/seismic integrity

2.3.3.15 Fire Protection (FP) System

System Description

The Fire Protection Program at BSEP consists of design features, equipment, personnel, and procedures that combine to provide multi-tiered safeguards against a fire that could impact the health and safety of the public. Within the Fire Protection Program, the FP System uses the philosophy of defense in depth. The objectives of the FP System are to: (1) Rapidly detect, control, and then promptly extinguish those fires that do occur; (2) Provide protection for SSCs important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant; and (3) Deliver extinguishing agents to areas of the plant through manually and automatically actuated devices.

Both water-based and gaseous fire suppression systems are used. The gaseous systems are the CO_2 and Halon Systems. Water suppression from duplicate sources and powered by independent means is available from the water based system in plain water or with foam both automatically and manually through sprinkler, deluge and hydrant/hose stations. Portable extinguishers are also available to provide an additional level of protection. The Fire Protection System includes physical barriers (doors, walls, seals, etc.) to inhibit the spread of fire and detection equipment for automatic suppression in selected areas. The physical barriers are addressed in the License Renewal review as structural commodities in Section 2.4.

Carbon dioxide fire suppression is used where the consequences of water damage are severe and the hazard can be mitigated readily by oxygen exclusion. The HPCI pump room in each Reactor Building is protected by an automatic, total flooding, fixed carbon dioxide fire suppression system. Each system consists of nozzles attached to a piping network which is connected to the main and reserve CO_2 banks. Each bank contains 22 high pressure cylinders. A selector switch is provided to select the desired bank for automatic operation. The HPCI CO_2 Storage Buildings are located adjacent to the outside east wall of each of the Reactor Buildings. The storage buildings are discussed in Subsection 2.4.2.15. The boundaries of the Fire Protection CO_2 System include the passive, long-lived components (cylinders, piping, valves and fittings) from the CO_2 supply cylinders to the most downstream distribution components (nozzles). Uniform distribution is not required for CO_2 fire suppression; therefore, aging of the nozzles is managed for only the pressure boundary function.

Halon systems provide fire protection for several areas and buildings. The only Halon suppression system within the scope of License Renewal protects equipment located in the Diesel Generator Building. This Halon System is a total flooding system consisting of four subsystems integrated with a nitrogen pilot system to simultaneously release the Halon. Each subsystem contains three floor-mounted cylinders each holding 500 pounds of Halon. The cylinders are connected to the system piping which distributes the Halon to six discharge nozzles in each quadrant of the Diesel Generator Building basement. The boundaries of the Halon System are the extremities of the system and include the passive, long-lived components (tanks, piping, valves and fittings) from the Halon supply tanks to the most downstream distribution ports (nozzles). Note that the nozzles are considered as sub-components of the piping and are not uniquely identified. Uniform dispersion of Halon is not required for fire suppression; therefore, aging of the nozzles is managed for only the pressure boundary function.

Design concepts used in the Fire Protection Program provide assurance that a fire will not cause the complete loss of function of safety related systems, even though limited loss of redundancy within one system may occur.

The FP System includes components, such as fire barrier seals, penetrations, and structures that protect safety related equipment. These components have been assigned a safety related function. Also, some fire barriers are part of Class I structures and are classified as safety related. Safety related structures are addressed for License Renewal in Section 2.4. In addition, the FP System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment.

The water-based system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The FP System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires.

<u>UFSAR and Drawing References</u>

The FP System is described in detail in BSEP UFSAR Section 9.5.1.4.

The License Renewal scoping boundaries for the Fire Protection System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.) The Fire Protection CO_2 System and the Halon System have no boundary drawings.

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-29099-LR, Sheets 1, 2	D-02043-LR, Sheet 1	D-02057-LR, Sheet 2A, 2B
	D-02299-LR	D-02058-LR, Sheet 3A, 3B
		D-02301-LR
		D-02302-LR
		D-02303-LR, Sheet 1, 2
		D-02304-LR
		D-04106-LR
		F-02315-LR, Sheet 1

Components Subject to AMR

The table below identifies the FP System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-12 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection (FP) System.

TABLE 2.3.3-12 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: FIRE PROTECTION SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Fire Protection Water	
Piping and Fittings (Includes Carbon Steel Fire Water Tank)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Filter, Fire Hydrants, Mulsifier, Pump Casing, Sprinkler, Strainer, and Valve Bodies (including containment isolation valves)	M-1 Provide pressure-retaining boundary M-8 Provide adequate flow in a properly distributed spray pattern
HTX - Heat Exchanger Shell and Access Cover	M-1 Provide pressure-retaining boundary
HTX - Heat Exchanger Tubes	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Diesel-Driven Fire Pump and Fuel Supply Line	M-1 Provide pressure-retaining boundary
Fire Protection CO_2	
CO2 Fire Suppression (HPCI)	M-1 Provide pressure-retaining boundary
Halon System	
Halon Fire Suppression (DGB)	M-1 Provide pressure-retaining boundary

2.3.3.16 Fuel Oil (FO) System

System Description

The FO System supplies #2 fuel oil for use by the Auxiliary Boiler, Diesel Fire Pump, and Emergency Diesel Engines. The FO System consists of the Main Diesel Fuel Oil Storage and Unloading Subsystem, the Fire Pump Diesel Engine Fuel Oil Subsystem, and the Auxiliary Boiler Fuel Oil Subsystem.

The Main Fuel Oil Storage Tank, in the Main Diesel Fuel Oil Storage and Unloading Subsystem, can supply each of the DG 4-day Fuel Oil Storage Tanks with fuel to support seven days of diesel operation. The tank is not safety related; however, it is in-scope for License Renewal, because it supports a safety related function. As discussed in the BSEP UFSAR, to ensure a seven-day supply following postulated damage to the Main Fuel Oil Storage Tank, fuel oil can be readily obtained by truck or rail directly to the Brunswick Plant, or by barge on the Cape Fear River or Intracoastal Waterway to local docks and off loaded into trucks for delivery to the site.

The Fire Pump Diesel Engine Fuel Oil Subsystem supports the function of demonstrating compliance with regulatory requirements for fire protection.

The fuel oil supply line to the Auxiliary Boiler is not in scope for License Renewal. The Auxiliary Boiler System is addressed in Subsection 2.3.4.4.

The FO System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

2. Components that are relied on during postulated fires.

UFSAR and Drawing References

The FO System is described in BSEP UFSAR Section 8.3.1.1.6.2.8.

The License Renewal scoping boundaries for the Fuel Oil System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
None	None	D-02026-LR

Components Subject to AMR

The table below identifies the FO System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-13 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Oil (FO) System.

TABLE 2.3.3-13 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: FUEL OIL SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Diesel-Driven Fire Pump and Fuel Supply Line	M-1 Provide pressure-retaining boundary
Valves Body and Tubing	M-1 Provide pressure-retaining boundary
Diesel Fuel Tank	M-1 Provide pressure-retaining boundary
Piping (Aboveground Pipe and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Tank (Internal/External Surface)	M-1 Provide pressure-retaining boundary

2.3.3.17 Radioactive Floor Drains System

System Description

Buildings at BSEP are designed and constructed to serve specific purposes and contain equipment necessary for the operation of the plant and to ensure safety to the general public. Each building is fitted with the necessary support equipment to ensure that the function of the building is fulfilled. The layout of drains and routing of drains to sumps ensures that water does not accumulate on floors and radiologically contaminated water does not mix with non-contaminated water. The function of the Radioactive Floor Drains System is to route all floor drains to the proper disposal facility.

The contaminated floor drainage system includes all floor drains from the Reactor Building, Turbine Building, Augmented Off-gas Building, the Radwaste Building and other floor drains having a potential for radioactive spillage. The collected drainage is transferred to the radwaste facility for processing.

The system penetrates primary containment, and components in the system provide the Primary Containment isolation function following postulated design basis events. In addition, some components provide post accident monitoring, for example, of containment isolation valve position.

The Radioactive Floor Drain System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment and to assure continued functioning of certain components following postulated earthquakes. Portions of the system support the function of detecting leakage from the RCPB.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment and non-safety related piping components connected to and providing support for the safety related functional boundary of the system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The Radioactive Floor Drain System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

3. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The Radioactive Floor Drain System is described in BSEP UFSAR Section 9.3.3.

The License Renewal scoping boundaries for the Radioactive Floor Drain System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25043-LR, Sheet 1B	D-02543-LR, Sheet 1B	None
D-25044-LR, Sheet 2	D-02544-LR	
D-25045-LR, Sheet 3B	D-02545-LR, Sheet 3B	
D-25046-LR	D-02546-LR	
	D-02533-LR, Sheet 2	

Components Subject to AMR

The table below identifies the Radioactive Floor Drains System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Radioactive Floor Drains System.

TABLE 2.3.3-14 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: RADIOACTIVE FLOOR DRAIN SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Flow Orifice (Body)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Pump (Casing)	M-1 Provide pressure-retaining boundary
Tank (Shell)	M-1 Provide pressure-retaining boundary
Drain System Sump Pumps	M-1 Provide pressure-retaining boundary

2.3.3.18 Radioactive Equipment Drains System

System Description

Buildings at BSEP are designed and constructed to serve specific purposes and contain equipment necessary for the operation of the plant and to ensure safety to the general public. Each building is fitted with the necessary support equipment to ensure that the function of the building is fulfilled. The layout of drains and routing of drains to sumps ensures that water does not accumulate on floors and radiologically contaminated water does not mix with non-contaminated water. The function of the Radioactive Equipment Drains System is to route all equipment drains to the proper disposal facility

Reactor Building equipment drains are collected in two separate subsystems. One handles drainage from all equipment drains located in the Drywell; the other handles drainage from equipment drains located in the Reactor Building. Individual Drywell equipment drain lines collect in branch lines and discharge to the Drywell Equipment Drain Sump; sump pumps transfer the collected fluid to the Radwaste System. The system includes automatic containment isolation valves on lines penetrating the Primary Containment. These valves provide the Primary Containment isolation function following postulated design basis events. The Reactor Building equipment drain subsystem begins with drain connections at equipment. Equipment drainage is collected in branch lines and discharged to the Reactor Building Equipment Drain Sump for transfer to the Radwaste System.

Drainage is also collected from the Turbine Building and Radwaste Building. The collected drainage is transferred to the radwaste facility for processing.

Components in the Radioactive Equipment Drains System provide a post accident monitoring function for containment isolation valve position. Also, the Radioactive

Equipment Drains System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment or to assure its function during and following a postulated earthquake. Portions of the system support the function of detecting leakage from the RCPB. Components in the system are environmentally qualified to function in harsh environment areas.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The Radioactive Equipment Drains System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The Radioactive Equipment Drains System is described in BSEP UFSAR Section 9.3.3.

The License Renewal scoping boundaries for the Radioactive Equipment Drains System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25043-LR, Sheet 1A	D-02543-LR, Sheet 1A, 1B	None
D-25045-LR, Sheet 3A	D-02545-LR, Sheet 3A	
	D-02531-LR, Sheet 1	

Components Subject to AMR

The table below identifies the Radioactive Equipment Drains System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-15 Auxiliary Systems – Summary of Aging Management Evaluation – Radioactive Equipment Drains System.

TABLE 2.3.3-15 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: RADIOACTIVE EQUIPMENT DRAINS SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Shell and Access Cover)	M-1 Provide pressure-retaining boundary
Flow Orifice (Body)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Pump (Casing)	M-1 Provide pressure-retaining boundary
Tank (Shell)	M-1 Provide pressure-retaining boundary

2.3.3.19 Makeup Water Treatment System (MWTS)

System Description

The MWTS supplies all normal requirements for demineralized water throughout the plant. The water supply to the MWTS is the county water system (formerly the supply was from the Well Water System). Piping in the MWTS is used to supply county water directly to the Fire Protection Water Tank for makeup. Demineralized water from the MWTS is supplied to the 200,000 gallon Demineralized Water Storage Tank from which redundant pumps distribute it through the plant demineralized water piping. The MWTS is a shared system between units providing a supply of high purity water free of materials that could become radioactive.

The MWTS includes a safety related component support, and it contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. Components in the system are credited with maintaining a fire protection water system flow path in support of compliance with fire protection regulations.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The MWTS is in the scope of License Renewal, because it contains:

1. A component that is safety related and is relied upon to remain functional during and following design basis events,
2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires.

UFSAR and Drawing References

The MWTS is described in BSEP UFSAR Section 9.2.3.

The License Renewal scoping boundaries for the MWTS are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25030-LR, Sheet 1, 2	D-02530-LR, Sheet 1, 2	D-02040-LR, Sheet 1A, 1B
D-25043-LR, Sheet 1A, 1B	D-02543-LR, Sheet 1A, 1B	D-02057-LR, Sheet 2B
D-25044-LR, Sheet 2	D-02544-LR	D-04035-LR, Sheet 2

Components Subject to AMR

The table below identifies the MWTS components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation – Makeup Water Treatment System (MWTS).

TABLE 2.3.3-16 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: MAKEUP WATER TREATMENT SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Water Treatment System	
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Demineralized Water System	
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Tank (Shell)	M-1 Provide pressure-retaining boundary

2.3.3.20 Chlorination System

System Description

The Chlorination (CL) System provides a means of treating the SW and CW Systems against biological growth. For Control Room habitability considerations, chlorine detectors are mounted at the Control Room air intakes, and attached to the wall of the Service Water Intake Structure immediately adjacent to the rail siding where the chlorine tank car is located. In the event high chlorine is detected, a local and Control Room alarm are activated, and the Control Room isolation dampers automatically close.

The CL System has a total of six components that place portions of this system within scope. Two of the six are electrical components that actuate isolation valves required to maintain the function of a safety related system (the SW System). Scoping and screening of electrical/I&C components/commodities are addressed in Section 2.5. The remaining components are panels designated quality class due to seismic considerations only. The panels are classified as seismically analyzed to avoid adverse interactions with safety related SSCs during an earthquake. Panels are addressed as civil commodities in Section 2.4.

The CL System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The CL System is described in BSEP UFSAR Section 10.4.5.2.

The CL System components that are in scope for License Renewal are electrical and I&C and civil components. No License Renewal boundary drawings are provided.

Components Subject to AMR

The CL System components that are subject to AMR are addressed as electrical and I&C component/commodities in Section 2.5 or as civil commodities in Section 2.4.

2.3.3.21 Potable Water System (PWS)

System Description

The PWS supplies the necessary water for onsite drinking and sanitary services and makeup to various components in miscellaneous plant systems. This system is supplied by the county water supply. The PWS is not essential for safe shutdown of the plant and does not satisfy any safety related quality criteria. Based on the BSEP License Renewal review, this system has components that are in scope for License Renewal because of potential spatial interactions with safety-related components. A potable water line traverses the control building battery rooms to supply water in the

Radwaste Building. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The PWS is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The PWS is described in BSEP UFSAR Section 9.2.4.

The License Renewal scoping boundaries for the PWS are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
None	None	D-04035-LR, Sheet 2

Components Subject to AMR

The table below identifies the PWS components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation – Potable Water System (PWS).

TABLE 2.3.3-17 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: POTABLE WATER SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Tank (Shell)	M-1 Provide pressure-retaining boundary

2.3.3.22 Process Radiation Monitoring (PRM) System

System Description

The PRM System is designed to continuously monitor radioactivity within the plant. A number of radiation monitors and monitoring systems are provided on process liquid and gas lines that may serve as discharge routes for radioactive materials. These include the following:

1. Main Steam Line Radiation Monitoring System
2. Condenser Off-Gas Radiation Monitoring System
3. Main Stack Radiation Monitoring System
4. Liquid Process Radiation Monitoring System
5. Reactor Building Ventilation Radiation Monitoring System
6. Turbine Building Ventilation Radiation Monitoring System
7. AOG Charcoal Adsorber System Gaseous Discharge Monitoring System

The Main Steam Line Monitors annunciate alarms in the Control Room when the radiation level of the steam surpasses a certain level. Radiation monitors are provided for the Condenser Off-Gas System to assure that proper measures can be taken to limit the total body exposure to an individual at the exclusion boundary to a small fraction of the limits of 10 CFR 50.67 in the event this effluent is inadvertently discharged directly to the environment without treatment. Effluent radiation monitors provided for the Main Stack and the ventilation exhausts from the Reactor Building and the Turbine Building alert the Control Room operators to high radiation discharges to the air and provide a permanent record of radioactive noble gas effluents. The processes are continuously sampled for particulate and iodine, and the samples are routinely analyzed. Safety related process radiation monitors in the Reactor Building exhaust can initiate Reactor Building isolation and startup of the SGTS. Monitors in the Service Water System are used to assure that effluents will have radiation levels below pre-established limits.

The portions of this system within the scope of License Renewal consist of both safety related and non-safety related components, as well as electrical components required to perform a safety function located in potentially harsh environments that are, therefore, environmentally qualified. PRM System instrumentation and control circuits actuate ESF functions to mitigate the radiological effects of design basis events and support post-accident monitoring of safety related systems. In addition, the PRM System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The PRM System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The PRM System is described in BSEP UFSAR Section 11.5.

No License Renewal boundary drawings are provided for the PRM System. The boundary consists of a radiation element in the RBCCW pressure boundary for each Unit. Refer to the RBCCW boundary drawings in Subsection 2.3.3.8.

Components Subject to AMR

The table below identifies the PRM System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-18 Auxiliary Systems – Summary of Aging Management Evaluation – Process Radiation Monitoring (PRM) System.

TABLE 2.3.3-18 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: PROCESS RADIATION MONITORING SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Closed-Cycle Cooling Water System (Piping Specialties)	M-1 Provide pressure-retaining boundary

2.3.3.23 Area Radiation Monitoring (ARM) System

System Description

The ARM System is designed to detect, indicate, and record (as required) the radiation level of selected points throughout BSEP. Permanently mounted system instrument channels actuate annunciators in the Control Room when the sensed radiation level exceeds upscale or downscale trip points to warn personnel of increased radiation levels or equipment malfunction.

The system consists of the following:

1. Area Radiation Monitoring (ARM) System
2. Drywell High Range Area Monitoring System
3. Airborne Radiation Monitoring System

The ARM System detectors are located strategically throughout the site. These detectors are located based upon the need to furnish information relative to gamma levels in plant areas.

The Drywell High Range Area Monitoring System consists of four instrument channels, separated two each into Division I and Division II, mounted inside the Drywell at widely varying locations. The detectors provide a long-term, post-accident monitoring function.

The Airborne Radiation Monitoring System uses fixed instruments to monitor particulates, halogens, and noble gases in the Reactor Building vents and in the Drywell. In addition, continuous air monitors are located in critical areas of the plant and may be moved as conditions require.

The Area Radiation Monitoring System consists of both safety related and seismically designed non-safety related components, as well as electrical components required to perform a safety function located in potentially harsh environments that are therefore environmentally qualified.

The ARM System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The ARM System is described in BSEP UFSAR Section 12.3.4.

The ARM System components that are in scope for License Renewal are electrical and I&C and civil components. No License Renewal boundary drawings are provided.

Components Subject to AMR

The ARM System components that are subject to AMR are addressed as electrical and I&C component/commodities in Section 2.5 or as civil commodities in Section 2.4.

2.3.3.24 Liquid Waste Processing System

System Description

The function of the Liquid Waste Processing System is to collect, treat, and process potentially radioactive liquid waste for reuse or controlled discharge in compliance with established regulatory requirements. The system processes radioactive or potentially radioactive liquid wastes of different purities and chemical conditions. Principal sources of liquid wastes are equipment drains (high purity), floor drains (medium to low purity), chemical wastes (very low purity), detergent, and oily liquid drains.

Liquid radwaste is classified in two categories; Clean Radioactive Waste (CRW) and Dirty Radioactive Waste (DRW). CRW has the following properties: low or high activities, low conductivity, low solid content and neutral pH. DRW has the following properties: low activity, moderate conductivity, moderate solid content and neutral pH. The properties of each category determine the treatment and processing of the liquid waste collected by this system.

Non-safety related components in the system are classified as seismically analyzed to avoid adverse interactions with safety related SSCs or to assure their continued function during an earthquake. Portions of the system support the function of detecting leakage from the RCPB. The Liquid Waste Processing System drain line supporting the Standby Gas Treatment System fire protection deluge valves performs the fire protection function.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment and non-safety related piping components connected to and providing support for the functional boundary of a safety related system. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The Liquid Waste Processing System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

2. Components that are relied on during postulated fires.

UFSAR and Drawing References

The Liquid Waste Processing System is described in BSEP UFSAR Section 11.2.

The License Renewal scoping boundaries for the Liquid Waste Processing System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25043-LR, Sheet 1A, 1B	D-02543-LR, Sheet 1A, 1B	D-02492-LR
D-25044-LR, Sheet 2	D-02544-LR, Sheet 2	D-02534-LR, Sheet 1, 2
D-25045-LR, Sheet 3A, 3B	D-02545-LR, Sheet 3A, 3B	
D-25046-LR	D-02546-LR	

Components Subject to AMR

The table below identifies the Liquid Waste Processing System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Waste Processing System.

TABLE 2.3.3-19 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: LIQUID WASTE PROCESSING SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Immersion Element (Pressure Retaining Housing)	M-1 Provide pressure-retaining boundary
Tank (Shell)	M-1 Provide pressure-retaining boundary

2.3.3.25 Spent Fuel System

System Description

The Spent Fuel System includes the New Fuel Racks, Spent Fuel Racks, underwater equipment storage racks; the Spent Fuel Shipping Cask; and associated handling equipment. The New and Spent Fuel Storage Racks are designed to maintain their structural integrity in the event of an earthquake and to avoid criticality of the fuel. The Spent Fuel Storage Racks are classified as safety related. In the License Renewal review, the Spent Fuel Storage Racks and equipment storage racks are evaluated as structures and are addressed in Section 2.4. The new fuel storage racks do not perform any intended functions for License Renewal.

The Spent Fuel Shipping Cask has a cylindrical configuration with an interchangeable basket arrangement to accommodate either BWR or PWR fuel assemblies. The Cask is designed to conform to 10 CFR 71 with regard to structural design; radiological releases, effects, and protection; allowable spent fuel shipping conditions; shielding; and continuity of decay heat removal capacity for all credible cask accident events. The definition of Current Licensing Basis in 10 CFR 54.3 does not include 10 CFR 71 as a cited regulation; therefore, the spent fuel cask is excluded from the scope of License Renewal.

The Spent Fuel Shipping Cask handling equipment consists of redundant lifting equipment. For the License Renewal review, the lifting equipment is considered to be portable tools that are excluded from the scope of License Renewal.

UFSAR and Drawing References

The Spent Fuel System is described in BSEP UFSAR Section 9.1.2.

The Spent Fuel System components consist of structural components associated with fuel and equipment storage racks. Therefore, no License Renewal boundary drawings are provided.

Components Subject to AMR

The Spent Fuel System components that are subject to AMR are evaluated as structural components and are addressed in Section 2.4.

2.3.3.26 Fuel Pool Cooling and Cleanup System

System Description

The Fuel Pool Cooling and Cleanup System cools the Spent Fuel Storage Pool by transferring decay heat through heat exchangers to the Reactor Building Closed Cooling Water System. During refueling operations, the system is also capable of cooling the reactor cavity and dryer separator storage pit. Water purity and clarity in the storage pool, reactor well, and dryer-separator storage pit are maintained by filters and demineralizers.

The system consists of two fuel pool cooling pumps, two heat exchangers, two filter demineralizers, two skimmer surge tanks, and associated piping, valves, and instrumentation. The pumps circulate the pool water in a closed loop, taking suction from the skimmer surge tanks, through the heat exchangers, circulating the water through the filter demineralizer and discharging it through diffusers at the bottom of the fuel pool and reactor well.

The system is designed such that during normal operation the fuel pool temperature does not exceed 125°F. The Supplemental Spent Fuel Pool Cooling System may be used during refuel outage periods to augment the installed fuel pool cooling system to maintain the spent fuel pool temperature at or below 150°F following a full core offload. There are no connections to the fuel pool that could drain the pool below the bottom of the pool overflows to the skimmer surge tanks when the refueling gates are in place. Piping entering the fuel pool is fitted with a check valve or siphon breaker holes to prevent water from being siphoned out of the pool.

The Fuel Pool Cooling and Cleanup System contains safety related fluid system components that support the function of the spent fuel pools. It also contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment and to assure its function during and following an earthquake.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The Fuel Pool Cooling and Cleanup System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The Fuel Pool Cooling and Cleanup System is described in detail in BSEP UFSAR Section 9.1.3.

The License Renewal scoping boundaries for the Fuel Pool Cooling and Cleanup System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-23007-LR	D-02307-LR	None
D-25026-LR, Sheet 2B	D-02526-LR, Sheet 2B	
D-25049-LR, Sheet 1A, 1B	D-02549-LR, Sheet 1A, 1B	

Components Subject to AMR

The table below identifies the Fuel Pool Cooling and Cleanup System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Pool Cooling and Cleanup System.

TABLE 2.3.3-20 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: FUEL POOL COOLING AND CLEANUP SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping, Fittings, and Flanges)	M-1 Provide pressure-retaining boundary M-3 Provide flow restriction
Valves (Check and Hand Valves) (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Shell and Access Cover)	M-1 Provide pressure-retaining boundary
Heat Exchanger (Channel Head and Access Cover)	M-1 Provide pressure-retaining boundary
Pump (Casing)	M-1 Provide pressure-retaining boundary

2.3.3.27 HVAC Diesel Generator Building

System Description

The purpose of the HVAC Diesel Generator Building is to maintain temperature conditions to allow for optimum operation of equipment located in the Diesel Generator Building and Fuel Oil Storage Tank Vault while providing comfort and safety for attendant personnel even during design basis conditions. This system supplies ventilation for the DG cells, associated 4160 VAC emergency switchgear rooms, 480 VAC emergency switchgear rooms, diesel generator building basement area, and the tank vault area.

This system is considered safety-related during all plant operational modes, because it is required to provide combustion air for the safety-related diesel generators, and it is required to supply ventilation air to maintain acceptable room temperatures for the diesel generators and associated areas.

The HVAC Diesel Generator Building contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment and to assure the function of equipment during and following an earthquake. The system is credited for mitigating a postulated SBO. Also, the HVAC Diesel Generator Building contains components that are credited with compliance with fire protection regulations and for safe shutdown following a fire.

The HVAC Diesel Generator Building is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events.

UFSAR and Drawing References

The HVAC Diesel Generator Building is described in BSEP UFSAR Section 9.4.7.

The License Renewal scoping boundaries for the HVAC Diesel Generator Building system are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
None	None	D-04101-LR

Components Subject to AMR

The table below identifies the HVAC Diesel Generator Building components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation – HVAC Diesel Generator Building.

TABLE 2.3.3-21 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: HVAC DIESEL GENERATOR BUILDING

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Air Receiver (Shell and Access Cover)	M-4 Provide structural support/seismic integrity
Duct (Duct Fittings, Access Doors, and Closure Bolts)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Duct (Equipment Frames and Housing)	M-1 Provide pressure-retaining boundary
Duct (Seals in Dampers and Doors)	M-1 Provide pressure-retaining boundary

2.3.3.28 HVAC Reactor Building

System Description

The HVAC Reactor Building system consists of two basic systems: the normal system and the emergency cooling system. During normal operation, the HVAC Reactor Building equipment provides a suitable ambient temperature for plant personnel and equipment by providing “once through” ventilation and cooling using outside air. The system maintains a negative pressure on the Reactor Building. The Primary Containment Cooling System uses non-safety related fan coil cooling units, cooled by RBCCW, to provide Drywell cooling during normal reactor operation. The Drywell and Torus Purge subsystem can be used to purge Primary Containment via either a purge system exhaust fan or the Standby Gas Treatment System.

The Reactor Building Emergency Cooling subsystem provides safety related cooling for the RHR, HPCI, RCIC, and Core Spray Rooms to maintain the environment in those areas required for operation of equipment during emergency operation. Dampers in the system operate to maintain secondary containment integrity in response to an accident signal. In the accident mode, the reactor building ventilation normal supply and exhaust equipment is shut down and the duct isolation dampers at the reactor building pressure boundaries are closed (Secondary Containment isolation). The Standby Gas Treatment System is operated to maintain a negative pressure in the reactor building. During this mode, the reactor building HVAC system performs a safety related function; since it supports limiting the release of radioactivity and provides cooling to safety-related equipment of the core standby cooling systems following design basis events.

Dampers in the HVAC Reactor Building support the Secondary Containment Isolation function; and instrumentation and control circuits in the system support the Secondary Containment Isolation damper position post accident monitoring function. The HVAC Reactor Building contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. In addition, the HVAC Reactor Building contains components that are credited with compliance with fire protection regulations and that are environmentally qualified to function in harsh environment areas.

The HVAC Reactor Building is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires,

4. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The HVAC Reactor Building equipment and functions are described in detail in BSEP UFSAR Sections 9.4.2, 9.4.3, and 9.4.6.

The License Renewal scoping boundaries for the HVAC Reactor Building are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-40056-LR	D-04056-LR	None
F-40073-LR, Sheet 1, 2	F-04073-LR, Sheet 1, 2	

Components Subject to AMR

The table below identifies the HVAC Reactor Building components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – HVAC Reactor Building.

TABLE 2.3.3-22 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: HVAC REACTOR BUILDING

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Air Receiver (Shell and Access Cover)	M-1 Provide pressure-retaining boundary
Duct (Duct Fittings, Access Doors, Damper Housings, and Closure Bolts)	M-1 Provide pressure-retaining boundary M-4 Provide structural support/seismic integrity
Duct (Equipment Frames and Housing, including Fan Housings)	M-1 Provide pressure-retaining boundary
Duct (Flexible Collars between Ducts and Fans)	M-1 Provide pressure-retaining boundary
Duct (Seals in Dampers and Doors)	M-1 Provide pressure-retaining boundary
Air Handler Heating/Cooling (Heating/Cooling Coils)	M-1 Provide pressure-retaining boundary M-5 Provide heat transfer
Piping (Piping and Fittings)	M-4 Provide structural support/seismic integrity
Filters (Housing and Supports)	M-1 Provide pressure-retaining boundary
Filters (Elastomer Seals)	M-1 Provide pressure-retaining boundary

2.3.3.29 HVAC Service Water Intake Structure

System Description

HVAC Service Water Intake Structure consists of two 100%-capacity independent ventilation systems (1 for each unit). Each independent system contains discharge fans, discharge dampers, associated electrical equipment, instrumentation and controls, and supply air openings with bird screens.

The system is necessary to control the environment in safety related equipment areas so that contained safety related equipment can perform its safety-related function. The HVAC Service Water Intake Structure provides ventilation and cooling of the SW Intake Structure for proper operation of SW System equipment. However, the fans are not ducted and do not have an associated pressure boundary.

The HVAC Service Water Intake Structure is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events.

UFSAR and Drawing References

The HVAC Service Water Intake Structure is described in BSEP UFSAR Section 9.4.10.2.7.

No License Renewal boundary drawings are provided for the HVAC Service Water Intake Structure.

Components Subject to AMR

The HVAC Service Water Intake Structure components that are subject to AMR are addressed as electrical and I&C component/commodities in Section 2.5 or as civil commodities in Section 2.4.

2.3.3.30 HVAC Turbine Building

System Description

HVAC Turbine Building is designed to provide effective control of airflow throughout the Turbine Building (TB) to maintain all areas at the temperature conditions which provide optimum operation of equipment and comfort and safety of personnel, to limit the spread of contamination during power and shutdown operations of the plant, and to minimize radioactive releases. The system is a recirculating type system, designed to operate during startup, normal operation, and shutdown of the plant.

The TB is maintained at a slight negative pressure by a separate air filtration exhaust system to prevent buildup of radioactivity in the building and to ensure that no unfiltered leakage occurs. The treatment of exhaust air by filters and charcoal absorption filters removes airborne particulates and gaseous radioactivity that might be present before discharging this air to the atmosphere. A separate ventilation system is provided for the Reactor Recirculation Pumps Motor Generator (MG) set room, which maintains the MG set room at a higher pressure than the TB, thereby, preventing in-leakage of radioactivity into the room.

The HVAC Turbine Building is not required to operate during plant accident conditions, does not contain any safety related equipment and is considered non-safety related. Certain non-safety related electrical components in the system have been classified as seismically analyzed to avoid adverse interactions with safety related SSCs during an earthquake.

The HVAC Turbine Building is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

<u>UFSAR and Drawing References</u>

The HVAC Turbine Building is described in BSEP UFSAR Section 9.4.5.

The HVAC Turbine Building components that are in scope for License Renewal are electrical and I&C components mounted on control boards. Therefore, no License Renewal boundary drawings are provided.

<u>Components Subject to AMR</u>

The HVAC Turbine Building components that are subject to AMR are addressed as civil component/commodities in Section 2.4.

2.3.3.31 HVAC Radwaste Building

<u>System Description</u>

The HVAC Radwaste Building limits the spread of contamination within the Radwaste Building, ensuring air movement from clean areas to areas with progressively higher contamination potential. The system also keeps the building at a slight negative static pressure to prevent the exfiltration of potentially radioactive air through other than the normal exhaust path, which is connected to the plant stack.

The HVAC Radwaste Building is not required to operate during plant accident conditions, does not contain any safety related equipment and is considered non-safety-related. Non-safety related components in the system are classified as seismically analyzed to avoid adverse interactions with safety related SSCs during an earthquake.

The HVAC Radwaste Building is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The HVAC Radwaste Building is described in BSEP UFSAR Section 9.4.4.

The HVAC Radwaste Building components that are in scope for License Renewal are electrical and I&C components mounted on control boards. Therefore, no License Renewal boundary drawings are provided.

Components Subject to AMR

The HVAC Radwaste Building components that are subject to AMR are addressed as civil component/commodities in Section 2.4.

2.3.3.32 Torus Drain System

The Torus Drain System functions as part of the primary containment pressure boundary, and it supports retention of the Suppression Pool inventory following postulated fires and SBO events. It also contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These non-safety related components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The Torus Drain System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events.

UFSAR and Drawing References

The Torus Drain System is not described in the BSEP UFSAR.

The License Renewal scoping boundaries for the Torus Drain System are shown on the following flow diagrams. (Flow diagrams have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-26098-LR	D-02698-LR	None

Components Subject to AMR

The table below identifies the Torus Drain System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/ commodities are provided in Table 3.3.2-23 Auxiliary Systems – Summary of Aging Management Evaluation – Torus Drain System.

TABLE 2.3.3-23 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: TORUS DRAIN SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Misc. auxiliary and drain piping and valves)	M-1 Provide pressure-retaining boundary

2.3.3.33 Civil Structure Auxiliary Systems

Most civil structures have support systems that provide auxiliary services for the structure, such as, floor drains, sump pumps, and associated discharge piping and valves. These systems may be in scope of License Renewal because they contain components that perform License Renewal intended functions. These systems have been evaluated to identify mechanical or electrical/I&C components that support License Renewal intended functions. Applicable components are discussed below.

System Description

Primary Containment Auxiliary System:

The Primary Containment structure includes containment hatch pressure indicators and associated valves and tubing components. These mechanical components provide a safety related function and are in scope for License Renewal.

Service Water Intake Structure Auxiliary System:

The Service Water Intake Structure contains non-safety related mechanical components associated with mitigating the effects of flooding as well as non-safety related components associated with the building sump and sump pump that prevent adverse spatial interactions. These components are within the scope of License Renewal and perform License Renewal intended functions.

Reactor Building Auxiliary System:

The Reactor Building Auxiliary System has a non-safety related door control switch that has been classified as seismically analyzed to prevent undesirable interactions with safety related equipment. The switch is within the scope of License Renewal and performs a License Renewal intended function. Aging management review of supports for this type of equipment is addressed as a structural commodity in Section 2.4.

Augmented Off Gas Building Auxiliary System:

Auxiliary systems associated with the Augmented Off Gas Building contain non-safety related pressure indicators that are classified as seismically analyzed to prevent adverse interactions with safety related equipment. These indicators are located in the Control Building and are in scope of License Renewal. Aging management review of supports for this type of equipment is addressed as a structural commodity in Section 2.4.

Auxiliary Boiler House Auxiliary System:

Auxiliary Boiler House Auxiliary Systems include non-safety related control switches within the scope of License Renewal that are classified as seismically analyzed to prevent adverse interactions with safety related equipment and are located in the Control Building. Aging management review of supports for this type of equipment is addressed as a structural commodity in Section 2.4.

Diesel Generator Building Auxiliary System:

The Diesel Generator Building Auxiliary Systems include safety related relays and level switches essential to the operation of other safety related components, non-safety related instrumentation which mitigates the effects of flooding, and piping components associated with the building sumps and sump pumps that perform an intended function of preventing adverse spatial interactions. These mechanical components are within the scope of License Renewal.

Control Building Auxiliary System:

The Control Building Auxiliary System has non-safety related control switches classified as seismically analyzed to prevent undesirable interactions with safety-related equipment and piping components associated with the building sumps and sump pumps that prevent adverse spatial interactions. These components are within the scope of License Renewal.

Radwaste Building Auxiliary System:

The Radwaste Building Auxiliary Systems include non-safety related relays that are located in the Control Building and are classified as having licensing commitments relating to seismic design. These components are within the scope of License Renewal. Aging management review of supports for this type of equipment is addressed as a structural commodity in Section 2.4.

In summary, the Civil Structure Auxiliary Systems are in the scope of License Renewal, because they contain either or both of the following:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

UFSAR and Drawing References

The Civil Structure Auxiliary Systems are not described in the BSEP UFSAR.

Components in the Civil Structure Auxiliary Systems are associated with structures and are not shown on License Renewal boundary drawings.

Components Subject to AMR

The table below identifies the Civil Structure Auxiliary Systems components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Civil Structure Auxiliary Systems.

TABLE 2.3.3-24 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: CIVIL STRUCTURE AUXILIARY SYSTEMS

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Primary Containment Auxiliary Systems	
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Service Water Intake Structure Auxiliary Systems	
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Pump (Casing)	M-1 Provide pressure-retaining boundary
Gauge Glasses (Pressure Retaining Housing)	M-1 Provide pressure-retaining boundary
Diesel Generator Building Auxiliary Systems	
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Pump (Casing)	M-1 Provide pressure-retaining boundary
Control Building Auxiliary Systems	
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Pump (Casing)	M-1 Provide pressure-retaining boundary

2.3.3.34 Non-Contaminated Water Drainage System

The Non-Contaminated Water Drainage System (NCWDS) is part of the Sewage, Sanitary, and Roof Drains System, which collects storm water, non-contaminated drainage, and sanitary wastes and transports them to collection and processing points for treatment prior to off-site discharge. The overall system is not essential for safe shutdown of the plant and does not satisfy any safety related quality criteria. Based on the BSEP License Renewal review, the NCWDS has components (roof drain piping) that are in scope for License Renewal because of potential spatial interactions with safety-related components. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The NCWDS is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

<u>UFSAR and Drawing References</u>

The NCWDS is described in BSEP UFSAR Section 9.3.3.2.3.

No License Renewal boundary drawings are applicable to the NCWDS.

Components Subject to AMR

The table below identifies the NCWDS components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.3.2-25 Auxiliary Systems – Summary of Aging Management Evaluation – Non-Contaminated Water Drainage System (NCWDS).

TABLE 2.3.3-25 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: NON-CONTAMINATED WATER DRAINAGE SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping (Piping and Fittings)	M-1 Provide pressure-retaining boundary

2.3.4 STEAM AND POWER CONVERSION SYSTEMS

The Steam and Power Conversion Systems act as a heat sink to remove heat from the reactor and convert the heat generated in the reactor to the plant's electrical output. The following systems are included in this Subsection:

1. Main Steam System (Subsection 2.3.4.1)
2. Extraction Steam System (Subsection 2.3.4.2)
3. Moisture Separator Reheater Drains System and Reheat Steam System (Subsection 2.3.4.3)
4. Auxiliary Boiler (Subsection 2.3.4.4)
5. Feedwater System (Subsection 2.3.4.5)
6. Heater Drains and Miscellaneous Vents and Drains (Subsection 2.3.4.6)
7. Condensate System (Subsection 2.3.4.7)
8. Turbine Building Sampling System (Subsection 2.3.4.8)
9. Main Condenser Gas Removal System (Subsection 2.3.4.9)
10. Turbine Electro-Hydraulic Control System (Subsection 2.3.4.10)
11. Turbine Generator Lube Oil System (Subsection 2.3.4.11)
12. Stator Cooling System (Subsection 2.3.4.12)
13. Hydrogen Seal Oil System (Subsection 2.3.4.13)

2.3.4.1 Main Steam (MS) System

System Description

The MS System delivers steam from the Nuclear Steam Supply System piping downstream of the outermost primary containment isolation valve to the turbine throttle over the full range of reactor power operation. This system also conveys steam to the second stage reheaters, condenser steam-jet air ejectors, turbine steam seal regulators, main turbine bypass, and reactor feed pump drive turbines. The turbine stop and control valves, control isolation valves, turbine bypass valves and associated hydraulic operators (hydraulic fluid supplied by the EHC system) are included in this system.

There are four main steam lines conveying steam to the turbine stop valves, with cross connections to the turbine bypass system and other equipment as required.

This system interfaces with the RCPB (but is not part of the RCPB) and does not penetrate the primary containment. The MS System is classified as non-safety related. Components in the system are classified as seismically analyzed to avoid adverse interactions with safety related SSCs during an earthquake. Turbine bypass valve position switches have been credited with meeting regulatory requirements for safe shutdown following a fire. The MS System includes components that have been credited in AST analyses of radiation doses following design basis accidents.

The MS System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

2. Components that are relied on during postulated fires.

UFSAR and Drawing References

The MS System is described in BSEP UFSAR Section 10.3.2.

The License Renewal scoping boundaries for the MS System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-20020-LR, Sheet 1, 2	D-02020-LR, Sheet 1, 2	None
D-25021-LR, Sheet 1A, 1B	D-02521-LR, Sheet 1A, 1B	
D-20028-LR	D-02028-LR	

Components Subject to AMR

The table below identifies the MS System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.4.2-1 Steam and Power Conversion Systems - Summary of Aging Management Evaluation – Main Steam (MS) System.

TABLE 2.3.4-1 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: MAIN STEAM SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Steam Lines to Main Turbine(Group B))	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage
Piping and Fittings (Steam Drains)	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage
Valves (Check, Control, Hand, Motor Operated, Safety Valves) (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage

2.3.4.2 Extraction Steam System

System Description

The Extraction Steam System provides steam heating to two strings (A & B) of five feedwater heaters, which progressively increase the feedwater temperature before it enters the reactor. The system also provides steam to the heater drains deaerator to remove non-condensable gases from the condensate.

This system consists of the piping and valves that extract steam from selected stages of the high pressure (HP) and low pressure (LP) turbines and supply the steam to the shell side of the feedwater heaters. Non-return valves are used to prevent overspeed of the turbine due to flashback of the condensate in the heaters after a turbine trip.

This system does not interface with the RCPB and does not penetrate the primary containment. The Extraction Steam System is classified as non-safety related. Certain electrical components in the system are classified as seismically analyzed to avoid adverse interactions with safety related SSCs during an earthquake.

The Extraction Steam System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The Extraction Steam System is described in BSEP UFSAR Section 10.3.2.

The Extraction Steam System components that are in scope for License Renewal are electrical and I&C components. No License Renewal boundary drawings are provided.

Components Subject to AMR

The Extraction Steam System components that are subject to AMR are addressed as civil commodities in Section 2.4.

2.3.4.3 Moisture Separator Reheater (MSR) Drains System and Reheat Steam System

System Description

The MSR Drains System returns large quantities of saturated water, removed in the Moisture Separator and condensed from the Reheat Steam System in the first and second stage reheater tubes, to the condensate cycle to improve cycle efficiency, operating stability, and reliability. System components include moisture separator drain tanks, 1st stage reheater drain tanks, 2nd stage reheater drain tanks, and the valves and piping necessary to remove liquid from the MSRs and direct it to the Condensate System for reuse.

Components in the system are classified as seismically analyzed to avoid adverse interactions with safety related SSCs during an earthquake.

The MSR Drains and Reheat Steam System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The MSR Drains and Reheat Steam System is described in UFSAR Section 10.2.2.

The MSR Drains and Reheat Steam System components that are in scope for License Renewal are electrical and I&C components. No License Renewal boundary drawings are provided.

Components Subject to AMR

The MSR Drains and Reheat Steam System components that are subject to AMR are addressed as civil commodities in Section 2.4.

2.3.4.4 Auxiliary Boiler

System Description

The Auxiliary Boiler System provides a source of non-contaminated steam independent of the Nuclear Steam Supply System. This is a unit-shared system providing: a) steam for operation of the CAC vaporizer and b) steam to Unit 1 and 2 for HPCI, RCIC, and reactor feed pump turbine testing prior to start up. Auxiliary steam is supplied by one packaged, fire tube boiler and distributed to the plant via a network of headers and piping.

This system consists of the auxiliary boiler and the following principal subsystems: fuel oil, combustion air, burner control, exhaust, feed, chemical addition, blowdown and deaerator. Non-safety related components in the system are classified as seismically analyzed to avoid adverse interactions with safety related SSCs during an earthquake.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The Auxiliary Boiler System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The Auxiliary Boiler System is described in BSEP UFSAR Section 10.4.8.

The License Renewal scoping boundaries for the Auxiliary Boiler System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
None	None	D-02021-LR

Components Subject to AMR

The table below identifies the Auxiliary Boiler System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.4.2-2 Steam and Power Conversion Systems - Summary of Aging Management Evaluation – Auxiliary Boiler System.

TABLE 2.3.4-2 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: AUXILIARY BOILER SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Steam Drains)	M-1 Provide pressure-retaining boundary
Valves (Check, Control, Hand, Motor Operated, Safety Valves) (Body and Bonnet)	M-1 Provide pressure-retaining boundary

2.3.4.5 Feedwater (FW) System

System Description

The FW System receives demineralized water from the Condensate System and delivers this water to the reactor at increased temperature and pressure. Condensate is pumped from the condenser hotwell through the three low pressure heaters to the common suction header for the two, 50 percent capacity, turbine-driven reactor feed pumps. Feedwater heaters receive shell-side steam and preheat the tube-side feedwater, thus increasing the heat cycle efficiency. All feedwater heaters and drain coolers are included in the FW System, and this system ends at the interfacing system safety related outermost primary containment isolation valves.

This system contains components associated with safety related reactor vessel pressure and level instrumentation, and safety related supports/pipe restraints. In addition, the system contains instrumentation relied on for safe shutdown following postulated fires and Station Blackout. Also, non-safety related components in the system are classified as seismically analyzed to avoid adverse interactions with safety related SSCs during an earthquake. Pipe supports/restraints are addressed as civil commodities in Section 2.4.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The FW System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events.

UFSAR and Drawing References

The FW System is described in BSEP UFSAR Section 10.4.7.

The License Renewal scoping boundaries for the FW System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25021-LR, Sheet 1A, 1B, 1C	D-02521-LR, Sheet 1A, 1B, 1C	None

Components Subject to AMR

The table below identifies the FW System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.4.2-3 Steam and Power Conversion Systems - Summary of Aging Management Evaluation – Feedwater (FW) System.

TABLE 2.3.4-3 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: FEEDWATER SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Main Feedwater Line (Pipe and Fittings (Group B or D))	M-1 Provide pressure-retaining boundary
Valves (Control, Check, and Hand Valves) (Body and Bonnet)	M-1 Provide pressure-retaining boundary

2.3.4.6 Heater Drains (HD) and Miscellaneous Vents and Drains (MVD)

System Description

The Heater Drains (HD) System is a cascading drain system. Extraction steam enters the heater shell side, gives up its energy to the condensate/feedwater passing through the tubes and is gravity drained to the next lower pressure heater. This system maintains the feedwater heaters and deaerator level, removes non-condensable gases from the feedwater heaters, supplies heating steam to the number 3 feedwater heaters and recovers the steam used for heating in the feedwater heaters.

The Miscellaneous Vents & Drains (MVD) System provides equipment drainage and vent paths to collection locations, including the Main Condenser. MVD piping includes drains from the Main Steam System, miscellaneous condensate header, Turbine Building area equipment, the HPCI steam supply drain pot, and the RCIC steam supply drain pot.

Components in the MVD System are credited in AST analyses for mitigation of radioactive releases following postulated accidents. The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment and non-safety related piping components connected to and providing support for safety related functional boundaries. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review. In addition, the HD and MVD Systems contain non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment.

The HD and MVD Systems are in the scope of License Renewal, because they contain:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The HD and MVD Systems are described in BSEP UFSAR Section 10.4.7.2.5.

The License Renewal scoping boundaries for the HD and MVD Systems are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-20028-LR	D-02028-LR	None

Components Subject to AMR

The table below identifies the HD and MVD Systems components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.4.2-4 Steam and Power Conversion Systems - Summary of Aging Management Evaluation – Heater Drains (HD) and Miscellaneous Vents and Drains (MVD) Systems.

TABLE 2.3.4-4 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: HEATER DRAINS AND MISCELLANOUS VENTS AND DRAINS SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Lines to Feedwater Heaters)	M-4 Provide structural support/seismic integrity
Piping and Fittings (Steam Drains)	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage

2.3.4.7 Condensate System

System Description

Condensate originates in the Main Condenser hotwells and comes primarily from exhaust steam exiting the Main Turbine and the Reactor Feed Pump Turbines. The Condensate Pumps take suction from the hotwells, pump the condensate forward through the tube side of several equipment condensers, and maintain balanced condensate flow to the feedwater heaters. Downstream, the condensate is processed through the Condensate Filter Demineralizers (CFDs) to Condensate Deep-Bed Demineralizers (CDDs), and the Condensate Booster Pumps.

BSEP Units 1 & 2 are each equipped with a 500,000 gallon capacity Condensate Storage Tank (CST) providing suction to Condensate Transfer Pumps, makeup water to the Main Condenser hotwells, alternate suction source to the CS and CRD Hydraulic Systems, and normal suction source to the RCIC and HPCI Systems. Hotwell makeup from the CST is directed to the low pressure drains flash tank and from there to the individual Condenser hotwell in need of makeup. CST makeup is supplied from the Demineralized Water Storage Tank. CFD and CDD condensate supply and return lines passing through the Cable Spread Rooms in the Control Building are seismically qualified to preclude flooding or damage to safety related components in these areas.

The condensate supply line to the CRD pumps is seismically designed from the Reactor Building wall to the pump. This increased classification is required to ensure critical equipment will not be flooded by a line break.

The Main Condenser provides a heat sink for the turbine exhaust steam, turbine bypass steam, and reactor feed pump turbine exhaust steam and is cooled by the Circulating Water System. The Main Condenser is credited in Alternative Source Term analyses.

The CDDs are used in conjunction with CFDs as part of the Condensate Polishing System to remove impurities and ensure the reactor receives water of the required purity. The CDDs are ion exchangers but will filter out material that bypasses the CFDs.

The Condensate System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. Seismically analyzed components include condensate supply piping to safety related pumps within the Reactor Building. In addition, components in the Condensate System are credited with compliance with fire protection requirements, assuring safe shutdown following a fire, and with compliance with SBO requirements.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The Condensate System is in the scope of License Renewal, because it contains:

1. Components that are safety-related and are relied upon to remain functional during and following design basis events,

2. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. Components that are relied on during postulated fires and station blackout events.

UFSAR and Drawing References

The Condensate System is described in BSEP UFSAR Sections 9.2.6, 10.4.1, and 10.4.7.

The License Renewal scoping boundaries for the Condensate System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-20030-LR, Sheet 1B	D-02030-LR, Sheet 1B	D-02040-LR, Sheet 1A, 1B
D-20028-LR	D-02028-LR	

Components Subject to AMR

The table below identifies the Condensate System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in

Table 3.4.2-5 Steam and Power Conversion Systems - Summary of Aging Management Evaluation – Condensate System.

TABLE 2.3.4-5 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: CONDENSATE SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Condensate System	
Condensate Lines (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Condensate Storage (Tank)	M-1 Provide pressure-retaining boundary
Condensate Demineralizer System	
Condensate Cleanup System (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Condensate Makeup System	
Condensate Lines (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary
Main Condenser	
Condensate Coolers/Condensers (Tubes)	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage
Condensate Coolers/Condensers (Tubesheet)	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage
Condensate Coolers/Condensers (Shell)	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage

2.3.4.8 Turbine Building (TB) Sampling System

System Description

For the TB, there is a central sample station, essentially a package of sample conditioning and analyzing sections and a sample hood. Samples can be taken continuously or obtained as grab samples for laboratory analysis and consist of three basic types: liquid sampling, steam sampling, and gaseous sampling. Grab samples are taken at the hood, which is designed for constant recovery and splashless withdrawal. The purpose of plant process sampling is to monitor the plant and equipment performance and to determine routine chemical properties and radiation levels necessary to provide information for equipment operation, corrosion control, and radiation activity. The system is not required either for safe shutdown or following an accident and is, therefore, not classified as an essential system. A small amount of tubing in the TB Sampling System is credited in Alternative Source Term analyses for mitigation of radioactive releases following postulated accidents.

The TB Sampling System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The TB Sampling System is described in BSEP UFSAR Section 9.3.2.

The License Renewal scoping boundaries for the TB Sampling System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-20020-LR, Sheet 1	D-02020-LR, Sheet 1	None

Components Subject to AMR

The table below identifies the TB Sampling System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.4.2-6 Steam and Power Conversion Systems - Summary of Aging Management Evaluation – Turbine Building (TB) Sampling System.

TABLE 2.3.4-6 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: TURBINE BUILDING SAMPLING SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Piping and Fittings (Steam Drains)	M-1 Provide pressure-retaining boundary M-7 Provide post-accident containment, holdup, and plateout of MSIV bypass leakage

2.3.4.9 Main Condenser Gas Removal System

System Description

During normal plant operation, non-condensable gases are produced and entrained in the reactor steam cycle and must be continuously removed to maintain turbine efficiency. These gases include hydrogen and oxygen from the radiolytic decomposition of water, fission products, activation products, and air from condenser in-leakage. The mixture is drawn from the Main Condenser via the steam jet air ejectors (SJAE). Motive force for the SJAE flow is provided by steam taken off the high pressure steam supply to the RFP turbines. Two mechanical vacuum pumps are used primarily during startup when there is insufficient reactor steam to operate the SJAE to maintain a condenser vacuum.

The steam and non-condensable mixture that exits the SJAE is mixed with oxygen injected from the Hydrogen Water Chemistry system. This is done to insure sufficient oxygen is available for scavenging all free hydrogen in the offgas mixture during the recombination process. The mixture is then passed through an offgas recombiner where hydrogen and oxygen are catalytically recombined to form water. After recombination, the off-gas is routed to a condenser to remove moisture and then through a 30 minute delay pipe before entering the Augmented Offgas Charcoal Adsorber System.

The Main Condenser Gas Removal System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment. Components in the Main Condenser Gas Removal System are credited for safe shutdown following a fire and with compliance with SBO requirements. The components credited with compliance with regulatory requirements for fire protection and Station Blackout are electrical/I&C components and are addressed In Section 2.5.

The system contains non-safety related components that have the potential to cause an adverse physical interaction with safety related equipment. These components have been included in scope of License Renewal as a result of the 10 CFR 54.4(a)(2) review.

The Main Condenser Gas Removal System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

2. Components that are relied on during postulated fires and station blackout events.

<u>UFSAR and Drawing References</u>

The Main Condenser Gas Removal System is described in more detail in BSEP UFSAR Section 10.4.2.

The License Renewal scoping boundaries for the Main Condenser Gas Removal System are shown on the following License Renewal boundary drawings. (License Renewal boundary drawings have been submitted separately for information only.)

BSEP Unit 1	BSEP Unit 2	BSEP Common
D-25043-LR, Sheet 1B	D-02543-LR, Sheet 1B	None

Components Subject to AMR

The table below identifies the Main Condenser Gas Removal System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.4.2-7 Steam and Power Conversion Systems - Summary of Aging Management Evaluation – Main Condenser Gas Removal System.

TABLE 2.3.4-7 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: MAIN CONDENSER GAS REMOVAL SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Condensate Lines (Piping and Fittings)	M-1 Provide pressure-retaining boundary
Valves (Body and Bonnet)	M-1 Provide pressure-retaining boundary

2.3.4.10 Turbine Electro-Hydraulic Control (EHC) System

System Description

The Turbine Electro-Hydraulic Control (EHC) System maintains a fixed load or speed of the turbine, depending on requirements, and provides turbine overspeed protection in the event of excessive unbalanced energy input to the turbine shaft. The objective of the system is to provide an energy control system that coordinates turbine generator load and reactor output power. The system operates the turbine stop valves, bypass valves, control valves, combined intermediate valves, and other protective devices and provides for mechanical and electrical trips of the turbine. The turbine pressure regulator manipulates turbine control valves and turbine bypass valves, individually or in parallel, to maintain constant reactor pressure at a chosen value. The turbine controls combine standard solid-state electronic operational amplifier elements with high pressure hydraulic actuators to produce a quick response speed-load control system. The Turbine EHC System supplies clean, cool, high pressure hydraulic fluid necessary for turbine valve operation. The system uses a pump taking suction on a hydraulic reservoir to supply all components requiring EHC fluid for operation.

The Turbine EHC System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment.

The Turbine EHC System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The Turbine EHC System is described in BSEP UFSAR Sections 10.2.2 and 7.7.1.4.

The Turbine EHC System components that are in scope for License Renewal are electrical and I&C and civil components. No License Renewal boundary drawings are provided.

Components Subject to AMR

The Turbine EHC System components that are subject to AMR are addressed as civil commodities in Section 2.4.

2.3.4.11 Turbine Generator Lube Oil (LO) System

System Description

The Turbine Generator LO System provides a reliable, continuous supply of clean cool oil to the turbine generator bearings, hydrogen sealing system, and turbine instrumentation during all modes of operation. System equipment includes oil coolers, pumps, strainers, filters and piping.

The Turbine Generator LO System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment.

The Turbine Generator LO System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The Turbine Generator LO System is not described in BSEP UFSAR.

The Turbine EHC System components that are in scope for License Renewal are electrical and I&C components. No License Renewal boundary drawings are provided.

Components Subject to AMR

The Turbine Generator LO System components that are subject to AMR are addressed as civil commodities in Section 2.4.

2.3.4.12 Stator Cooling System

System Description

The Stator Cooling Water System automatically regulates the temperature and flow of clean, low conductivity, water to cool the Main Generator stator windings and the power rectifiers of the generator exciter. The cooling water is in direct contact with the stator windings which enhances the heat transfer rate from the copper windings and enables the generator to assume varying loads while eliminating most of the thermal stresses induced in the winding insulation. The system consists of a closed cooling loop that is, in turn, cooled by the TBCCW System (Refer to Subsection 2.3.3.9). The scope of this system includes the Stator Leak Monitoring System (SLMS). The SLMS monitors the in-leakage of hydrogen into the stator cooling water. Additionally, SLMS provides for the proper oxygenation of the stator cooling water to promote the formation of cupric oxide, a tough and durable coating, on the stator bar internal surfaces.

The Stator Cooling Water System contains non-safety related equipment that is classified as seismically analyzed to prevent undesirable interactions with safety related equipment.

The Stator Cooling Water System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The Stator Cooling Water System is not described in BSEP UFSAR.

The Stator Cooling Water System components that are in scope for License Renewal are electrical and I&C components. No License Renewal boundary drawings are provided.

Components Subject to AMR

The Stator Cooling Water System components that are subject to AMR are addressed as civil commodities in Section 2.4.

2.3.4.13 Hydrogen Seal Oil System

System Description

The Hydrogen Seal Oil System supplies sealing oil to the generator shaft seal rings to prevent the escape of hydrogen from the generator casing. The seal oil, supplied from the turbine main bearing oil header, is vacuum treated to remove air and moisture, and boosted in pressure above that of the hydrogen pressure in the generator casing. Non-safety related components in the system have been classified as seismically analyzed to avoid adverse interactions with safety related SSCs during an earthquake.

The Hydrogen Seal Oil System is in the scope of License Renewal, because it contains:

1. Components which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The Hydrogen Seal Oil System is not described in BSEP UFSAR.

The Hydrogen Seal Oil System components that are in scope for License Renewal are supports for electrical and I&C components. No License Renewal boundary drawings are provided.

Components Subject to AMR

The Hydrogen Seal Oil System components that are subject to AMR are addressed as civil commodities in Section 2.4.

2.4 SCOPING AND SCREENING RESULTS – STRUCTURES

The determination of structures within the scope of License Renewal is made by initially identifying BSEP structures and then reviewing them to determine which ones satisfy one or more of the criteria contained in 10 CFR 54.4. A description of this process is provided in Section 2.1, and the results of the structures scoping review are contained in Section 2.2.

Section 2.1 also provides the methodology for determining the structures and components (SCs) within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The SCs that meet these screening requirements are identified in this section. These SCs require an aging management review for License Renewal.

Screening results are provided below in two Subsections: (1) Containment, and (2) Other Class 1 and In-Scope Structures.

2.4.1 CONTAINMENT

The containment design includes a primary and a secondary containment. The Primary Containment is located within the Reactor Building. The Reactor Building for each BSEP Unit, in conjunction with its heating and ventilation system and associated Standby Gas Treatment System, constitutes the secondary containment system. The Reactor Building is discussed in Subsection 2.4.2.8 below.

2.4.1.1 Primary Containment

Description

The Primary Containment for each BSEP Unit is a pressure suppression system consisting of a Drywell and a pressure suppression chamber. The Drywell houses the reactor vessel, the reactor coolant recirculation loops, and other branch connections of the RCS. In the event of a process system piping failure, reactor water and steam will be released into the Drywell atmosphere. The resulting increased Drywell pressure will then force a mixture of Drywell atmosphere, steam, and water through the vents which open beneath the surface of the pool of water stored in the suppression chamber. The steam will condense in the water resulting in a rapid pressure reduction in the Drywell. The Primary Containment is designed to contain the energy released during the design basis loss-of-coolant accident (LOCA) and to limit the fission products associated with this accident that are released to the Reactor Building (Secondary Containment). Primary Containment is classified as a Seismic Class I structure and must remain functional and protect vital equipment and systems both during and following the most severe natural phenomenon postulated to occur at the site.

The Primary Containment is a BWR Mark I design located in the Reactor Building of each BSEP Unit. Unlike other BWRs which employ a Mark I containment fabricated of steel, the BSEP Primary Containment is constructed of reinforced concrete with a steel liner.

The major structural components of the Primary Containment are the Drywell, sacrificial shield, reactor pedestal, suppression chamber (also called the Torus or wetwell), and a connecting venting system. The Drywell is a steel-lined, reinforced concrete, Class I containment structure. A steel dome covers the top of the Drywell and is connected to the containment liner extension by a double-gasketed, bolted connection. At the center of the Drywell is a cylindrical reinforced concrete pedestal, which supports the reactor and sacrificial shield wall. The sacrificial shield wall is a concrete filled circular structural steel frame, which surrounds the reactor pressure vessel and is provided for reactor support and shielding purposes.

The suppression chamber consists of a hollow, reinforced concrete shell of rectangular cross-section encircling the lower portion of the Drywell containment structure. The concrete encloses sixteen, 3/8-inch thick, cylindrical steel sections that are connected to form a torus-shaped steel liner.

Primary Containment provides several intended functions including providing support and shelter for equipment within the scope of License Renewal and providing a barrier to fission product release following postulated design basis accidents. Primary Containment structures provide a heat sink during SBO or design basis accidents and provide barriers to fire, flooding, water spray, high energy fluid release and potential missile hazards. The volume of water contained in the Torus provides a source of cooling water for plant shutdown.

The Primary Containment is in the scope of License Renewal because it contains:

1. SCs that are safety-related and are relied upon to remain functional during and following design basis events,

2. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. SCs that are relied on during postulated fires, anticipated transients without scram, and station blackout events,

4. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The Primary Containment is described in Sections 3.8.2 and 6.2.1 of the BSEP UFSAR. Major Primary Containment structures are shown on Figure 3.5-1. The locations of the Reactor Buildings for both Units are shown on Figure 2.2-1.

Components Subject to AMR

The table below identifies the Primary Containment components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-1: Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Primary Containment.

TABLE 2.4.1-1 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: PRIMARY CONTAINMENT

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Anchorage/Embedment	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Anchorage/Embedments- Exposed (At the AMR stage, this commodity was consolidated within the proper support group: Piping Supports, Electrical Supports, Equipment Supports, HVAC Supports, Instrument Supports, etc.)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Bellows (Refueling)	C-8 Flood Barrier
Cable Tray and Conduit	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Above Grade	C-1 Pressure Boundary C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-6 Missile Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Sacrificial Shield Wall	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Curbs	C-13 Spray Shield/Curb
Doors and Framing/Hardware	C-3 Shelter/Protection
Downcomers (open-ended pipes attached to Torus vent header)	C-1 Pressure Boundary
Drywell Head	C-1 Pressure Boundary C-3 Shelter/Protection
Drywell Liner	C-1 Pressure Boundary C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Enclosure	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]

TABLE 2.4.1-1 (continued) COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: PRIMARY CONTAINMENT

Electrical Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Equipment Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Floor Drains	C-8 Flood Barrier
HVAC Support	C-7 Structural/Functional Support [Criterion a(2) requirement]
Instrument Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Insulation	C-3 Shelter/Protection
Liner (sump)	C-2 Structural/Functional Support [Criterion a(1) requirement]
Moisture Barrier	C-3 Shelter/Protection
Penetration (Mechanical and Electrical)	C-1 Pressure Boundary C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Drywell Personnel Airlock, Equipment Hatch, CRD Hatch	C-1 Pressure Boundary C-3 Shelter/Protection
Pipe Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Reactor Pressure Vessel Support	C-2 Structural/Functional Support [Criterion a(1) requirement]
Seals and Gaskets (Manways, airlocks, doors, hatches)	C-1 Pressure Boundary
Slide Bearing Plate	C-7 Structural/Functional Support [Criterion a(2) requirement]
Structural Steel: Platforms stairways, mezzanines and hardware	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Torus Liner	C-1 Pressure Boundary C-2 Structural/Functional Support [Criterion a(1) requirement] C-5 Cooling Water C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement] C-12 Heat Sink
Vent Header (Drywell to Torus vent lines and ring header)	C-1 Pressure Boundary C-2 Structural/Functional Support [Criterion a(1) requirement]
Vent Line Bellows	C-1 Pressure Boundary
Whip Restraints (includes jet impingement shields)	C-11 Pipe Whip/Jet Impingement

2.4.2 OTHER CLASS I AND IN-SCOPE STRUCTURES

The following structures are included in this Subsection:

1. Intake and Discharge Canals (Subsection 2.4.2.1)
2. Refueling System (Subsection 2.4.2.2)
3. Switchyard and Transformer Yard Structures (Subsection 2.4.2.3)
4. Monorail Hoists (Subsection 2.4.2.4)
5. Bridge Cranes (Subsection 2.4.2.5)
6. Gantry Cranes (Subsection 2.4.2.6)
7. Service Water Intake Structure (Subsection 2.4.2.7)
8. Reactor Building (Subsection 2.4.2.8)
9. Augmented Off-Gas Building (Subsection 2.4.2.9)
10. Diesel Generator Building (Subsection 2.4.2.10)
11. Control Building (Subsection 2.4.2.11)
12. Turbine Building (Subsection 2.4.2.12)
13. Radwaste Building (Subsection 2.4.2.13)
14. Water Treatment Building (Subsection 2.4.2.14)
15. Miscellaneous Structures and Out-Buildings(Subsection 2.4.2.15)

2.4.2.1 Intake and Discharge Canals

Description

The Intake and Discharge Canals are part of the circulating water system in which water is taken from the Cape Fear River and discharged into the Atlantic Ocean. The inlet canal begins at the Cape Fear Estuary and terminates at the plant intake structures. Adjacent to the Service Water Intake Structure and the Circulating Water Intake Structure, within the Intake and Discharge Canals system, are circular sheet-pile caissons acting as a transition between the earthen intake canal and the concrete intake structures. The discharge canal, originating at the southwest area of the plant site, at the discharge weir, travels southwest, crossing under the intracoastal waterway through reinforced concrete pipes. The concrete pipes discharge into a stilling basin, which terminates at the Caswell Beach Pumping Facility.

The Intake and Discharge Canals system is classified Seismic Class II and does not perform any safety-related function. However, the ultimate heat sink for the plant is the Cape Fear River estuary, and cooling water is supplied to the plant from the ultimate heat sink via the Intake Canal. Although no SSCs within the system are classified with a License Renewal function based on their EDB safety classifications, the functions for non-safety SSCs affecting safety related SSCs and providing a source of cooling water for plant shutdown have been assigned to the Intake Canal because it is the source of cooling water for the plant shutdown intended function. The Discharge Canal does not support any License Renewal intended functions, because blockage of the discharge path sufficient to threaten the safety related water supply is not considered to be credible owing to the physical arrangement and elevations of the discharge facilities.

The Intake Canal portion of the Intake and Discharge Canals system is in the scope of License Renewal because it contains:

1. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions

UFSAR and Drawing References

The Intake and Discharge Canals are described in UFSAR Section 2.4.8. A portion of the Intake Canal is shown on Figure 2.2-1.

Components Subject to AMR

The table below identifies the Intake and Discharge Canals components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in

Table 3.5.2-2 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Intake and Discharge Canals.

TABLE 2.4.2-1 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: INTAKE AND DISCHARGE CANALS

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Canal (Intake Canal only)	C-5 Cooling Water C-7 Structural/Functional Support [Criterion a(2) requirement]
Sheet Piles	C-7 Structural/Functional Support [Criterion a(2) requirement]

2.4.2.2 Refueling System

Description

The Refueling System is comprised of the refuel platforms, the auxiliary work platform, and various tools, equipment, and structures associated with fuel handling for both new and spent fuel. The refuel platform is unique to each unit; however, the auxiliary work platform and various tools are shared between units. The refuel platform for each unit runs on rails over the fuel pool and reactor well on elevation 117 ft of the Reactor Building. The passive physical crane structures, such as the main structural members, bridge, trolley, structural girders, rail system, and anchorage brackets, are considered subcomponents of the refuel platform. The auxiliary work platform is common to both units and is disassembled and moved to support the unit being refueled. Fuel preparation machines are suspended from the side of the spent fuel pools and are used to load new fuel into the fuel pool and to serve as a workstation from which irradiated fuel is de-channeled for inspection. Refueling tools were determined during screening to perform no License Renewal intended functions. The Refueling System contains non-safety related SCs classified as seismically analyzed to prevent undesirable interactions with safety related equipment. Therefore, SCs within the Refueling System are required to support License Renewal intended functions.

The Refueling System is in the scope of License Renewal because it contains:

1. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The Refueling System is described in UFSAR Section 9.1.4. The arrangement of a refuel platform in the Reactor Building is shown on UFSAR Figures 1-7 and 1-8.

Components Subject to AMR

The table below identifies the Refueling System components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-3 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Refueling System.

TABLE 2.4.2-2 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REFUELING SYSTEM

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Fuel Preparation Machines	C-7 Structural/Functional Support [Criterion a(2) requirement]
Auxiliary Work Platform	C-7 Structural/Functional Support [Criterion a(2) requirement]
Refueling Platforms	C-7 Structural/Functional Support [Criterion a(2) requirement]

2.4.2.3 Switchyard and Transformer Yard Structures

Description

The Relay Building and structures in the Switchyard and Transformer Yard have been combined under the one structural system: Switchyard and Transformer Yard Structures. These structures are located west of the Turbine Building. The Relay Building is shared between Units, and each Unit has its own switchyard and transformer yard. The design function of these structures is to support, house, and protect components associated with the Switchyard, Transformer Yard, and Relay Building. The Switchyard and Transformer Yard Structures contain no safety related components nor do they perform any safety related functions; however, the structures contribute to recovery from a Station Blackout event and are, therefore, within the scope of License Renewal.

The Switchyard and Transformer Yard Structures are in the scope of License Renewal because they contain:

1. SCs that are relied on during postulated station blackout events.

UFSAR and Drawing References

Switchyard and Transformer Yard Structures are described in UFSAR Section 8.2.1.3 and shown on Figure 2.2-1.

Components Subject to AMR

The table below identifies the Switchyard and Transformer Yard Structures components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-4 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Switchyard and Transformer Yard Structures.

TABLE 2.4.2-3 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: SWITCHYARD AND TRANSFORMER YARD STRUCTURES

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Anchorage/Embedment – Embedded	C-10 Structural/Functional Support [Criterion a(3) requirement]
Anchorage/Embedments - Exposed (At the AMR stage, this commodity was consolidated within the proper support group: Piping Supports, Electrical Supports, Equipment Supports, HVAC Supports, Instrument Supports, etc.)	C-10 Structural/Functional Support [Criterion a(3) requirement]
Cable Tray and Conduit	C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Above Grade	C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Below Grade	C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Enclosure	C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Support	C-10 Structural/Functional Support [Criterion a(3) requirement]
Equipment Support	C-10 Structural/Functional Support [Criterion a(3) requirement]
Piles	C-10 Structural/Functional Support [Criterion a(3) requirement]
Siding	C-10 Structural/Functional Support [Criterion a(3) requirement]
Structural Steel: Platforms, stairways, mezzanines, and hardware	C-10 Structural/Functional Support [Criterion a(3) requirement]

2.4.2.4 Monorail Hoists

Description

Monorail Hoists are structural/mechanical systems used during plant maintenance to move or remove equipment. The Monorail Hoist system is not shared between units and is not required for abnormal or accident plant operating modes. Monorail Hoists contain SCs classified as non-safety related that are located or mounted in the proximity of safety related equipment and whose failure during or following a design basis earthquake could detrimentally affect the accomplishment of a safety related function.

Monorail Hoists are in the scope of License Renewal because they contain:

1. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

Monorail Hoists are described in UFSAR Section 9.1.5.

Components Subject to AMR

Monorails are considered to be structural steel within the License Renewal civil screening process. The basis for this is that monorails are fixed, permanent, structural members upon which removable hoists are installed when maintenance is required. The hoisting apparatus is typically removed from the monorail when not required for maintenance; however, in some cases the hoists are moved to a safe location on the monorail and secured to prevent inadvertent movement or interaction with safety related components. Therefore, only the structural members and anchorages associated with monorail hoists are considered to be License Renewal commodities, and the AMR results for monorail hoists are documented under the review of the structural steel commodity in the structures containing the hoists.

2.4.2.5 Bridge Cranes

Description

Bridge Cranes are structural/mechanical systems used during plant maintenance to move or remove equipment. The Bridge Cranes within scope of License Renewal are the 125-ton Reactor Building Bridge Cranes; the Diesel Generator Bridge Cranes; and the Refueling Jib Cranes.

Two of the Refueling Jib Cranes have been removed from service. The remaining Refueling Jib Crane and the Diesel Generator Bridge Cranes have been screened as structural steel with monorail hoists in the previous subsection. In addition, the Unit 1 and Unit 2 Turbine Building Bridge Cranes perform no License Renewal intended functions. Only the Reactor Building Bridge Cranes for Units 1 and 2, classified as safety related, are in scope for License Renewal. The passive physical crane structures, such as the main structural members, bridge, trolley, structural girders, rail system, and anchorage brackets, are considered subcomponents of the Reactor Building Bridge Cranes.

The Reactor Building Bridge Cranes were designed to CMAA Specification #70, with a service class of A1, corresponding to a cyclic loading of between 20,000 and 100,000 cycles.

Bridge Cranes are in the scope of License Renewal because they contain:

1. SCs that are safety-related and are relied upon to remain functional during and following design basis events.

UFSAR and Drawing References

The Bridge Cranes are described in UFSAR Section 9.1.5.

Components Subject to AMR

The table below identifies the Bridge Cranes components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-5 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Bridge Cranes.

TABLE 2.4.2-4 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: BRIDGE CRANES

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Unit 1 Reactor Building Bridge Crane	C-2 Structural/Functional Support [Criterion a(1) requirement]
Unit 2 Reactor Building Bridge Crane	C-2 Structural/Functional Support [Criterion a(1) requirement]

2.4.2.6 Gantry Cranes

Description

Gantry Cranes are structural/mechanical components used during plant maintenance to move or remove equipment. Gantry Cranes are not required for abnormal or accident plant operating modes. The BSEP Gantry Cranes are shared between units and consist of the Heater Bay Gantry Crane and the Intake Structure Gantry Crane. The Gantry Cranes are designed in accordance with CMAA Specification No. 70 and ANSI B30.2.0-67.

Only the Intake Structure Gantry Crane is in scope for License Renewal, because it has the potential to impact the Class I Service Water Intake Structure should a structural failure occur. The passive physical crane structures, such as the main structural members, bridge, trolley, structural girders, rail system, and anchorage brackets, are considered subcomponents of the Intake Structure Gantry Crane.

The Intake Structure Gantry Crane is in the scope of License Renewal because it contains:

1. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions.

UFSAR and Drawing References

The Intake Structure Gantry Crane is located above the Circulating Water Intake structure and is shown on Figure 2.2-1.

The Intake Structure Gantry Crane is described in UFSAR Section 9.1.5.

Components Subject to AMR

The table below identifies the Gantry Cranes components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-6 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Gantry Cranes.

TABLE 2.4.2-5 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: GANTRY CRANES

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Intake Structure Gantry Crane	C-7 Structural/Functional Support [Criterion a(2) requirement]

2.4.2.7 Service Water Intake Structure

Description

The SW Intake Structure is located west of the Intake Canal and east of the Augmented Off-Gas Building. The SW Intake Structure is a Seismic Class I structure approximately 104’ long by 72’ feet wide and directs cooling water to the Service Water pumps via four intake bays from the Intake Canal. In the SW Intake Structure, a separate chamber is provided for the ten service water pumps; and two chambers are provided for the four screen wash water pumps with two pumps per chamber. The purpose of the SW Intake Structure is to house and protect Service Water System components. The structure is common to both units.

The scope of the SW Intake Structure initially included the Circulating Water Intake Structure concrete and other concrete wetted structures in close proximity to the SW

Intake Structure. However, the seismic Class II Circulating Water Intake Structure was screened out, because it is located a sufficient distance from the SW Intake Structure to preclude adverse interactions. The Intake Structure Gantry Crane is located within the physical boundary of the SW Intake Structure; and the crane, crane rails, and associated hardware have been screened with other gantry cranes above. The concrete structure supporting the crane rails in the vicinity of the SW Intake Structure is addressed with the SW Intake Structure.

The SW Intake Structure is in the scope of License Renewal because it contains:

1. SCs that are safety-related and are relied upon to remain functional during and following design basis events,

2. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. SCs that are relied on during postulated fires.

UFSAR and Drawing References

The SW Intake Structure is described in UFSAR Sections 3.8.4.1.4 and 9.2.1.2. The Circulating Water Intake Structure is described in UFSAR Sections 3.8.4.1.4 and 10.4.5.1. Both structures are shown on Figure 2.2-1.

Components Subject to AMR

The table below identifies the SW Intake Structure components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Service Water Intake Structure.

TABLE 2.4.2-6 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: SERVICE WATER INTAKE STRUCTURE

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Anchorage/Embedment – Embedded	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]

TABLE 2.4.2-6 (continued) COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: SERVICE WATER INTAKE STRUCTURE

Anchorage/Embedments- Exposed (At the AMR stage, this commodity was consolidated within the proper support group: Piping Supports, Electrical Supports, Equipment Supports, HVAC Supports, Instrument Supports, etc.)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Cable Tray and Conduit	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Above Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-4 Fire Barrier C-6 Missile Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Below Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Submerged	C-2 Structural/Functional Support [Criterion a(1) requirement] C-5 Cooling Water C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Doors and Framing/Hardware	C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement C-8 Flood Barrier
Electrical Enclosure	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Equipment Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Fire Hose Station	C-10 Structural/Functional Support [Criterion a(3) requirement]
Floor Drains	C-8 Flood Barrier
HVAC Support	C-2 Structural/Functional Support [Criterion a(1) requirement]

TABLE 2.4.2-6 (continued) COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: SERVICE WATER INTAKE STRUCTURE

Instrument Racks	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Masonry Walls	C-8 Flood Barrier
Penetration	C-2 Structural/Functional Support [Criterion a(1) requirement] C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Pipe Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Roof-Membrane / Built-Up	C-3 Shelter/Protection
Seals and Gaskets	C-3 Shelter/Protection
Spray Shield	C-13 Spray Shield/Curb
Sprayed on Coatings	C-4 Fire Barrier
Structural Steel: Platforms, stairways, mezzanines, and hardware	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]

2.4.2.8 Reactor Building

Description

The Reactor Building encloses the primary containment which consists of the Drywell and pressure suppression chamber. The Reactor Building houses the refueling and reactor service equipment, new and spent fuel storage facilities, and other reactor services and auxiliary equipment. The Reactor Building serves as a secondary containment during normal plant operation when the Primary Containment is functional. In addition, the Reactor Building serves as the containment boundary during reactor refueling and maintenance operations, when the Primary Containment is open. Each Unit has a Reactor Building; it is not a common or shared structure.

The secondary containment system includes the Secondary Containment (Reactor Building) structure and the safety related systems provided to control the ventilation and cleanup of potentially contaminated volumes, exclusive of the Primary Containment, following a design basis accident. The safety objective of the Secondary Containment is to limit the release of radioactivity to the environs after an accident so that the resulting exposures are kept to a practical minimum and are within regulatory limits. The Secondary Containment minimizes the consequences of an accident by providing a controlled release of the Reactor Building atmosphere through filters at an elevated point. Also, the Reactor Building protects and houses SSCs that must function following design basis events.

The Reactor Building provides several intended functions including providing support and shelter for equipment within the scope of License Renewal and providing a barrier to fission product release following postulated design basis accidents. Reactor Building structures provide barriers to fire, flooding, water spray, high energy fluid release and potential missile hazards. The Reactor Building also supports the function of providing a path for release of filtered discharge to the plant stack.

The Reactor Building is in the scope of License Renewal because it contains:

1. SCs that are safety-related and are relied upon to remain functional during and following design basis events,

2. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. SCs that are relied on during postulated fires, anticipated transients without scram, and station blackout events,

4. Components that are part of the Environmental Qualification Program.

UFSAR and Drawing References

The Reactor Building is described in UFSAR Section 3.8.4.1.1. The Unit 1 and Unit 2 Reactor Buildings are shown on Figure 2.2-1.

Components Subject to AMR

The table below identifies the Reactor Building components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Reactor Building.

TABLE 2.4.2-7 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR BUILDING

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Anchorage/Embedment – Embedded	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Anchorage/Embedments- Exposed (At the AMR stage, this commodity was consolidated within the proper support group: Piping Supports, Electrical Supports, Equipment Supports, HVAC Supports, Instrument Supports, etc.)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Bellows (RCIC Line Bellows – MSIV Pit)	C-3 Shelter/Protection
Blow-Out Panel	C-1 Pressure Boundary C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection
Cable Tray and Conduit	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Above Grade	C-1 Pressure Boundary C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-4 Fire Barrier C-6 Missile Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Below Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Curbs	C-13 Spray Shield/Curb
Damper Mounting	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Doors and Framing/Hardware (includes airlock doors)	C-1 Pressure Boundary C-4 Fire Barrier C-8 Flood Barrier
Electrical Enclosure	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]

TABLE 2.4.2-7 (continued) COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: REACTOR BUILDING

Equipment Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Fire Barrier Assembly	C-4 Fire Barrier
Fire Hose Station	C-10 Structural/Functional Support [Criterion a(3) requirement]
Floor Drains	C-8 Flood Barrier
HVAC Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Racks	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Liner (Reactor cavity & spent fuel pool)	C-2 Structural/Functional Support [Criterion a(1) requirement]
Masonry Walls	C-2 Structural/Functional Support [Criterion a(1) requirement] C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Penetration (Mechanical and Electrical)	C-1 Pressure Boundary C-2 Structural/Functional Support [Criterion a(1) requirement] C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Pipe Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Roof-Membrane / Built-Up	C-3 Shelter/Protection
Seals and Gaskets	C-1 Pressure Boundary C-3 Shelter/Protection
Siding (pressure boundary)	C-1 Pressure Boundary C-3 Shelter/Protection
Slide Bearing Plate (Torus radial beams and spent fuel rack support)	C-2 Structural/Functional Support [Criterion a(1) requirement]
Spent Fuel Storage Rack	C-2 Structural/Functional Support [Criterion a(1) requirement]
Spray Shield	C-13 Spray Shield/Curb
Sprayed on Coatings	C-4 Fire Barrier
Structural Steel: Platforms, stairways, mezzanines, and hardware	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Tendons (concrete girders spanning the Reactor Building)	C-2 Structural/Functional Support [Criterion a(1) requirement]
Whip Restraints	C-11 Pipe Whip/Jet Impingement Protection

2.4.2.9 Augmented Off-Gas Building

Description

The Augmented Off-Gas (AOG) Building, also known as the Nitrogen and Off Gas Services Building, is located east of the Unit 1 Reactor Building and west of the Service Water Intake Structure. The AOG Building is constructed of reinforced concrete with three working elevations. The primary purpose of the AOG Building is to house safety related SSCs that provide a makeup source of nitrogen to control combustible gases in the reactor containment following a loss-of-coolant accident (LOCA). The primary system providing the combustible gas control is the Containment Atmospheric Dilution (CAD) subsystem of the Containment Atmosphere Control (CAC) System, which is an ESF. Portions of the CAD are located in the AOG Building.

The AOG Building is a Seismic Class I structure designed to meet seismic, tornado, hurricane, and flooding requirements. It is shared between the BSEP Units.

The AOG Building is in the scope of License Renewal because it contains:

1. SCs that are safety-related and are relied upon to remain functional during and following design basis events,

2. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. SCs that are relied on during postulated fires.

UFSAR and Drawing References

The AOG Building is described in UFSAR Sections 3.8.4.2.5 and 6.2.5. The AOG Building is shown on Figures 2.2-1.

Components Subject to AMR

The table below identifies the AOG Building components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-9 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Augmented Off-Gas Building.

TABLE 2.4.2-8 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: AUGMENTED OFF-GAS BUILDING

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Anchorage/Embedment – Embedded	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Anchorage/Embedments- Exposed (At the AMR stage, this commodity was consolidated within the proper support group: Piping Supports, Electrical Supports, Equipment Supports, HVAC Supports, Instrument Supports, etc.)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Cable Tray and Conduit	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Above Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-4 Fire Barrier C-6 Missile Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Below Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Doors and Framing/Hardware	C-4 Fire Barrier C-8 Flood Barrier
Electrical Enclosure	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Equipment Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Fire Hose Station	C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Racks	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]

TABLE 2.4.2-8 (continued) COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: AUGMENTED OFF-GAS BUILDING

Masonry Walls	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Penetrations (Mechanical and Electrical)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Pipe Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Slide Bearing Plate (Nitrogen tank supports)	C-2 Structural/Functional Support [Criterion a(1) requirement]
Structural Steel: Platforms, stairways, mezzanines, and hardware	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]

2.4.2.10 Diesel Generator Building

Description

The Diesel Generator Building is located east of the Radwaste Building and the Reactor Buildings. The Diesel Generator Building is a reinforced concrete structure consisting of three levels housing an electrical spreading area, four diesel generator units, auxiliary equipment, electrical switchgear, diesel generator intake and exhaust equipment, and building ventilating equipment. The DG exhaust silencers are located on the DG Building roof. After passing through the silencers, exhaust gases are routed away from DG Building structures and do not impinge on any structures that could fall and block the DG exhaust flow path.

Underground diesel fuel storage tanks are located to the east of the building in a reinforced concrete vault, i.e., the Tank Building. The Diesel Generator Building and the Tank Building are Seismic Class I structures and house and protect safety related SSCs. In the License Renewal review, the Tank Building is considered part of the Diesel Generator Building.

The Diesel Generator Building is in the scope of License Renewal because it contains:

1. SCs that are safety-related and are relied upon to remain functional during and following design basis events,

2. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. SCs that are relied on during postulated fires and station blackout events.

UFSAR and Drawing References

UFSAR Section 3.8.4.1.3 provides a description of the Diesel Generator Building; the building is shown on Figure 2.2-1.

Components Subject to AMR

The table below identifies the Diesel Generator Building components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-10 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Diesel Generator Building.

TABLE 2.4.2-9 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: DIESEL GENERATOR BUILDING

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Anchorage/Embedment – Embedded	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Anchorage/Embedments- Exposed (At the AMR stage, this commodity was consolidated within the proper support group: Piping Supports, Electrical Supports, Equipment Supports, HVAC Supports, Instrument Supports, etc.)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Blow-Out Panel	C-2 Structural/Functional Support [Criterion a(1) requirement]
Cable Tray and Conduit	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Above Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-4 Fire Barrier C-6 Missile Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]

TABLE 2.4.2-9 (continued) COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: DIESEL GENERATOR BUILDING

Concrete Below Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Curbs	C-13 Spray Shield/Curb
Damper Mounting	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Doors and Framing/Hardware	C-4 Fire Barrier C-8 Flood Barrier
Electrical Enclosure	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Equipment Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Fire Barrier Assembly	C-4 Fire Barrier
Fire Hose Station	C-10 Structural/Functional Support [Criterion a(3) requirement]
Floor Drains	C-8 Flood Barrier
HVAC Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Racks	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Masonry Walls	C-2 Structural/Functional Support [Criterion a(1) requirement] C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Penetrations (Mechanical and Electrical)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Pipe Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]

TABLE 2.4.2-9 (continued) COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: DIESEL GENERATOR BUILDING

Roof-Membrane/Built-Up	C-3 Shelter/Protection
Siding	C-3 Shelter/Protection
Spray Shield	C-13 Spray Shield/Curb
Sprayed on Coatings	C-4 Fire Barrier
Structural Steel: Platforms, stairways, mezzanines, and hardware	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Vibration Isolators (At the AMR stage, this commodity was consolidated within the proper support group: Piping Supports or HVAC Supports.)	C-7 Structural/Functional Support [Criterion a(2) requirement]

2.4.2.11 Control Building

Description

The Control Building is a reinforced concrete structure located inside the protected area, between the two reactor buildings. The Control Building is a shared structure between the two units and is sub-divided into the following principal areas:

1. Cable spreading areas and battery rooms
2. Control room and electronic equipment rooms
3. HVAC equipment room located in a one-story penthouse

The Control Building is a Seismic Class I structure designed to support, house, and protect safety related systems and components. In addition, the Control Building supports the post-accident habitability function by providing radiation shielding and a barrier to fission products for the control room operating staff.

The Control Building is in the scope of License Renewal because it contains:

1. SCs that are safety-related and are relied upon to remain functional during and following design basis events,

2. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. SCs that are relied on during postulated fires, anticipated transients without scram, and station blackout events.

UFSAR and Drawing References

The Control Building is described in UFSAR Sections 3.8.4.1.2.and 6.4. The Control Building is shown on Figure 2.2-1.

Components Subject to AMR

The table below identifies the Control Building components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Control Building.

TABLE 2.4.2-10 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: CONTROL BUILDING

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Anchorage/Embedment – Embedded	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Anchorage/Embedments- Exposed (At the AMR stage, this commodity was consolidated within the proper support group: Piping Supports, Electrical Supports, Equipment Supports, HVAC Supports, Instrument Supports, etc.)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Battery Rack	C-2 Structural/Functional Support [Criterion a(1) requirement]
Cable Tray and Conduit	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Above Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-4 Fire Barrier C-6 Missile Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Below Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]

TABLE 2.4.2-10 (continued) COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: CONTROL BUILDING

Control Room Ceiling	C-7 Structural/Functional Support [Criterion a(2) requirement]
Damper Mounting	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Doors and Framing/Hardware	C-1 Pressure Boundary C-4 Fire Barrier
Electrical Enclosure	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Equipment Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Fire Barrier Assembly	C-4 Fire Barrier
Fire Hose Station	C-10 Structural/Functional Support [Criterion a(3) requirement]
HVAC Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Racks	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Masonry Walls	C-2 Structural/Functional Support [Criterion a(1) requirement] C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Penetration (Mechanical and Electrical)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Pipe Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Raised Floor	C-2 Structural/Functional Support [Criterion a(1) requirement]
Roof-Membrane/Built-Up	C-3 Shelter/Protection
Seals and Gaskets	C-1 Pressure Boundary
Sprayed on Coatings	C-4 Fire Barrier
Structural Steel: Platforms, stairways, mezzanines, and hardware	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]

2.4.2.12 Turbine Building

Description

The Turbine Building is located north of the Service Building and west of Reactor and Control Buildings, within the protected area. The Turbine Building and adjacent auxiliary bay houses the turbine generators, condensers, reactor feedwater systems, as well as other turbine plant auxiliary equipment, electrical switchgear and Reactor Recirculation Pump Motor Generator sets. The building is supported on spread footings founded on structural backfill and is constructed of reinforced concrete up to and including the operating floor. Reinforced concrete shield walls for equipment are provided above the operating floor for radiation protection. The superstructure above the operating floor is a steel framed crane bay with panel siding and roof constructed of metal deck, insulation, and membrane roofing. The Turbine Building is a Seismic Class II structure that provides support for equipment credited in the performance of the AST function.

The Turbine Building is in the scope of License Renewal because it contains:

1. SCs that are safety-related and are relied upon to remain functional during and following design basis events,

2. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. SCs that are relied on during postulated fires, anticipated transients without scram, and station blackout events.

UFSAR and Drawing References

The Turbine Building is described in UFSAR Section 3.8.4.2.1. The building is shown on Figure 2.2-1.

Components Subject to AMR

The table below identifies the Turbine Building components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Turbine Building.

TABLE 2.4.2-11 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: TURBINE BUILDING

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Anchorage/Embedment	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Anchorage/Embedments- Exposed (At the AMR stage, this commodity was consolidated within the proper support group: Piping Supports, Electrical Supports, Equipment Supports, HVAC Supports, Instrument Supports, etc.)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Cable Tray and Conduit	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Above Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Below Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Curbs	C-8 Flood Barrier
Doors and Framing/Hardware	C-4 Fire Barrier C-8 Flood Barrier
Electrical Enclosure	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Equipment Support	C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Fire Barrier Assembly	C-4 Fire Barrier
Fire Hose Station	C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Racks	C-2 Structural/Functional Support [Criterion a(1) requirement]
Instrument Support	C-10 Structural/Functional Support [Criterion a(3) requirement]

TABLE 2.4.2-11 (continued) COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: TURBINE BUILDING

Masonry Walls	C-2 Structural/Functional Support [Criterion a(1) requirement] C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Penetrations (Mechanical and Electrical)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-4 Fire Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Pipe Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Roof-Membrane/Built-Up	C-10 Structural/Functional Support [Criterion a(3) requirement]
Siding	C-10 Structural/Functional Support [Criterion a(3) requirement]
Structural Steel: Platforms, stairways, mezzanines, and hardware	C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]

2.4.2.13 Radwaste Building

Description

The Radwaste Building is located inside the protected area and is constructed on a reinforced concrete mat founded on structural fill. The building consists of two principal levels constructed with reinforced concrete walls and slabs. The thickness of the walls and slabs was determined by shielding and structural requirements. The Radwaste Building was designed as a Class II structure; however, to ensure the integrity of the Class I Control Building and Class I storage tanks in the Radwaste Building basement, the Radwaste building was designed for Class I seismic loads. The Radwaste Building foundation mat supports the following augmented quality equipment:

1. Concentrated Waste Tank
2. Waste Collector Tank
3. Waste Neutralizer Tanks

The Radwaste Building is a shared structure between the two units. The design function of the Radwaste Building is to support, house, and protect Radwaste systems and components. .

The Radwaste Building is in the scope of License Renewal because it contains:

1. SCs that are safety-related and are relied upon to remain functional during and following design basis events,

2. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. SCs that are relied on during postulated fires.

UFSAR and Drawing References

The Radwaste Building is described in UFSAR Section 3.8.4.2.2. The building is shown on Figure 2.2-1.

Components Subject to AMR

The table below identifies the Radwaste Building components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-13 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Radwaste Building.

TABLE 2.4.2-12 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: RADWASTE BUILDING

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Anchorage/Embedment – Embedded	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Anchorage/Embedments- Exposed (At the AMR stage, this commodity was consolidated within the proper support group: Piping Supports, Electrical Supports, Equipment Supports, HVAC Supports, Instrument Supports, etc.)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Cable Tray and Conduit	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Above Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-6 Missile Barrier C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]

TABLE 2.4.2-12 (continued) COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: RADWASTE BUILDING

Concrete Below Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-8 Flood Barrier C-10 Structural/Functional Support [Criterion a(3) requirement]
Doors and Framing/Hardware	C-8 Flood Barrier
Electrical Enclosure	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Fire Hose Station	C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Support	C-10 Structural/Functional Support [Criterion a(3) requirement]
Pipe Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Roof-Membrane/Built-Up	C-10 Structural/Functional Support [Criterion a(3) requirement]

2.4.2.14 Water Treatment Building

Description

The Water Treatment Building is a steel frame structure located within the protected area north of the Unit 1 Reactor Building. The Water Treatment Building contains Fire Protection pumps and other Fire Protection-related SSCs, which support BSEP fire protection commitments. The Water Treatment Building is a single structure that contains both Unit 1 and Unit 2 components. It is a Seismic Class II structure that does not support any safety related components or functions.

The Water Treatment Building is in the scope of License Renewal because it contains:

1. SCs that are relied on during postulated fires.

UFSAR and Drawing References

The Water Treatment Building is described in UFSAR Section 3.8.4.2.3. The building is shown on Figure 2.2-1.

Components Subject to AMR

The table below identifies the Water Treatment Building components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-14 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Water Treatment Building.

TABLE 2.4.2-13 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: WATER TREATMENT BUILDING

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Anchorage/Embedment – Embedded	C-10 Structural/Functional Support [Criterion a(3) requirement]
Anchorage/Embedments- Exposed (At the AMR stage, this commodity was consolidated within the proper support group: Piping Supports, Electrical Supports, Equipment Supports, HVAC Supports, Instrument Supports, etc.)	C-10 Structural/Functional Support [Criterion a(3) requirement]
Battery Rack	C-10 Structural/Functional Support [Criterion a(3) requirement]
Cable Tray and Conduit	C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Above Grade	C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Below Grade	C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Enclosure	C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Support	C-10 Structural/Functional Support [Criterion a(3) requirement]
Equipment Support	C-10 Structural/Functional Support [Criterion a(3) requirement]
Fire Barrier Assembly	C-4 Fire Barrier
Instrument Support	C-10 Structural/Functional Support [Criterion a(3) requirement]
Pipe Support	C-10 Structural/Functional Support [Criterion a(3) requirement]
Siding	C-10 Structural/Functional Support [Criterion a(3) requirement]
Structural Steel: Platforms, stairways, mezzanines, and hardware	C-10 Structural/Functional Support [Criterion a(3) requirement]

2.4.2.15 Miscellaneous Structures and Out-Buildings

Description

Miscellaneous Structures and Out-Buildings consist of those structures and out-buildings that are stand-alone structures and not part of, or attached to, one of the major building systems. The Miscellaneous Structures and Out-Buildings evaluated for License Renewal include foundations and structural support arrangements for mechanical system equipment such as outside tanks, electrical racks, and oil loading stations. Typically, the License Renewal classification for miscellaneous structures or outbuildings is the same as the electrical or mechanical SCs that it supports. The following miscellaneous structures and out-buildings were determined to be in scope for License Renewal:

1. HPCI CO_2 Bottle Storage Buildings, Units 1 and 2

The HPCI CO_2 Storage Buildings are located on the east side of and adjacent to their respective Reactor Building. SCs associated with the HPCI CO_2 Storage Buildings are the building structure, foundation, and anchorage arrangement. The HPCI CO_2 Storage Building is a fabricated sheet metal structure mounted on a concrete slab. The HPCI CO_2 Storage Buildings provide CO_2 fire suppression to the HPCI Pump Rooms; therefore, they support a License Renewal intended function for fire protection.

2. Condensate Storage Tank Foundations, Units 1 and 2

The Condensate Storage Tanks (CSTs) for each Unit are located east of their respective Reactor Buildings. The civil components associated with the CSTs are the foundations and anchorage arrangement. Each CST receives and stores water for various plant uses. The CSTs are carbon steel construction and mounted on a concrete foundation. The License Renewal review determined that the CSTs support the intended function for SBO.

3. Diesel Generator Building Oil Tank Room Foam System Concentrate Tank

The Diesel Generator Building (DGB) Oil Tank Room Foam System Concentrate Tank is located between the DGB and the Fuel Oil Storage Tank in the Aqueous Fire Fighting Foam (AFFF) Building. The civil components associated with the DGB Oil Tank Room Foam System are the building, foundation, and anchorage arrangement. The AFFF Building is a sheet metal fabricated building supported by a concrete footing/slab. The DGB Oil Tank Room Foam System Concentrate Tank provides fire protection for the DG Building.

4. Service Water Valve Pits, Units 1 and 2

The Unit 1 and Unit 2 Service Water Valve Pits are located between the Diesel Generator Building and the Fuel Oil Storage Tank. The civil commodity associated with the Service Water Valve Pits is concrete below grade. Service water is supplied from the Service Water Intake Structure to and from the DG Building via the Service Water Valve Pits. The Service Water Valve Pits provide structural support, shelter, and protection to safety related SW System equipment.

5. Fuel Oil Storage Tank Foundation

The Fuel Oil Storage Tank (FOST) is located east of the DG Building and south of the AOG Building. The civil components associated with the FOST are the foundation, anchorage, and surrounding dike. The FOST supplies fuel to the four, 4-Day Diesel Fuel Oil Storage Tanks located in the Tank Building. The FOST is in scope of License Renewal as a non-safety related component that supports a safety related function, and the dike for the Fuel Oil Storage Tank is in the scope of License Renewal for Fire Protection.

6. Fire Protection Water Tank Foundation

The Fire Protection Water Tank is located just north of the Demineralized Water Tank, inside the protected area. The SCs associated with the tank are the foundations and anchorage arrangement. The tank supports a License Renewal intended function for Fire Protection.

7. Stack and Filter House

The Plant Stack and Stack Filter House are located south of the Circulating Water Intake Structure. The Plant Stack is an unlined, free standing, reinforced concrete structure. The Plant Stack foundation is a reinforced concrete mat founded on concrete fill. The Filter House is located at the base of the stack. The Plant Stack is classified as Seismic Class I; the filter house, as Seismic Class II. The Plant Stack provides an elevated release point for discharges from the Standby Gas Treatment System; and the stack and filter house provide structural and functional support for safety related SSCs.

8. Manholes and Duct Banks

There are Manholes and Duct Banks located throughout the plant area. SSCs associated with Manholes and Duct Banks provide shelter and structural support to safety related equipment; provide structural support to non-safety related equipment where failure of this structural component could prevent satisfactory accomplishment of any of the required safety related functions; and provide structural support and/or shelter to components required for Fire Protection and SBO.

9. Demineralized Water Tank

The Demineralized Water Tank (DWT) is located just east of the Water Treatment Building. Civil SCs within the scope of License Renewal and associated with the DWT are the tank foundation and anchorages. The DWT is of aluminum construction and supports the License Renewal intended function for Fire Protection. The DWT provides a source of FP water; however, the DW Transfer Pumps are not required to perform this function.

The Miscellaneous Structures and Out-Buildings are in the scope of License Renewal because they contain:

1. SCs that are safety-related and are relied upon to remain functional during and following design basis events,

2. SCs which are non-safety related whose failure could prevent satisfactory accomplishment of the safety related functions,

3. SCs that are relied on during postulated fires and station blackout events.

UFSAR and Drawing References

Except for manholes and electrical duct banks, the location of these structures is shown on Figure 2.2-1.

Components Subject to AMR

The table below identifies the Miscellaneous Structures and Out-Buildings components and commodities requiring aging management review (AMR) and their intended functions. The AMR results for these components/commodities are provided in Table 3.5.2-15 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Miscellaneous Structures and Out-Buildings.

TABLE 2.4.2-14 COMPONENT COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: MISCELLANOUS STRUCTURES AND OUT-BUILDINGS

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Anchorage/Embedment – Embedded	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Anchorage/Embedments - Exposed	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Cable Tray and Conduit	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Above Grade	C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete Below Grade	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Concrete BWR Vent Stack	C-2 Structural/Functional Support [Criterion a(1) requirement] C-9 Discharge Flow Path
Tank Foundation	C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Enclosure	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Electrical Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Instrument Support	C-2 Structural/Functional Support [Criterion a(1) requirement] C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Manholes (addressed under Concrete Below Grade)	C-2 Structural/Functional Support [Criterion a(1) requirement] C-3 Shelter/Protection C-7 Structural/Functional Support [Criterion a(2) requirement] C-10 Structural/Functional Support [Criterion a(3) requirement]
Piles	C-10 Structural/Functional Support [Criterion a(3) requirement]
Siding	C-10 Structural/Functional Support [Criterion a(3) requirement]
Structural Steel: Platforms, stairways, mezzanines, and hardware	C-10 Structural/Functional Support [Criterion a(3) requirement]

2.5 SCOPING AND SCREENING RESULTS – ELECTRICAL AND INSTRUMENTATION AND CONTROLS (I&C) SYSTEMS

The determination of electrical/I&C systems within the scope of License Renewal is made through the application of the process described in Section 2.1.1. The results of the electrical/I&C systems scoping review are contained in Section 2.2. Section 2.1.2 provides the screening methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section. These identified components consequently require an aging management review for License Renewal.

The methodology used to identify electrical/I&C components requiring an aging management review is discussed in Subsection 2.1.2.3. The screening for electrical/ I&C components was performed on a generic component (commodity group) basis for the in-scope electrical/I&C systems listed in Table 2.2-3, as well as the electrical/I&C component types associated with in-scope mechanical systems and civil structures listed in Tables 2.2-1 and 2.2-2.

The interface of electrical/I&C components with other types of components and the assessments of these interfacing components are provided in the appropriate mechanical or civil/structural sections. For example, the assessment of electrical racks, panels, cabinets, cable trays, conduit, and their supports is provided in the civil/structural assessment documented in Section 2.4.

2.5.1 ELECTRICAL/I&C COMPONENT COMMODITY GROUPS

The first step of the screening process for electrical/I&C components involves using plant documentation to identify the different types of electrical equipment and components within the electrical/I&C systems. Electrical/I&C component types were identified from a review of plant documents, controlled drawings, the EDB, and information from previous License Renewal applications and by interfacing with the parallel mechanical and civil screening efforts. The electrical/I&C component commodity groups identified at BSEP are listed in the table below. This list includes all electrical and I&C component commodity groups listed in Table 2.1-5 of NUREG-1800.

<table>
<tr><th colspan="4">ELECTRICAL/I&C COMPONENT COMMODITY GROUPS FOR IN-SCOPE SYSTEMS AND STRUCTURES AT BSEP</th></tr>
<tr><td>Alarm Units</td><td rowspan="3">Electrical portions of Electrical/I&C Penetration Assemblies</td><td>Light Bulbs</td><td>Solenoid Operators</td></tr>
<tr><td rowspan="2">Analyzers</td><td>Load Centers</td><td>Signal Conditioners</td></tr>
<tr><td>Loop Controllers</td><td>Solid-State Devices</td></tr>
<tr><td>Annunciators</td><td>Elements</td><td>Meters</td><td>Splices</td></tr>
<tr><td>Batteries</td><td>Fuses</td><td>Motor Control Centers</td><td>Surge Arresters</td></tr>
<tr><td>Phase bus</td><td>Generators</td><td>Motors</td><td>Switches</td></tr>
<tr><td>Chargers</td><td>Heat Tracing</td><td>Power Distribution Panels</td><td>Switchgear</td></tr>
<tr><td>Circuit Breakers</td><td>Heaters</td><td>Power Supplies</td><td>Switchyard Bus</td></tr>
<tr><td>Converters</td><td>High-voltage Insulators</td><td>Radiation Monitors</td><td>Terminal Blocks</td></tr>
<tr><td rowspan="2">Communication Equipment</td><td>Indicators</td><td>Recorders</td><td>Thermocouples</td></tr>
<tr><td rowspan="2">Insulated Cables and Connections</td><td>Regulators</td><td>Transducers</td></tr>
<tr><td rowspan="3">Electrical Controls and Panel Internal Component Assemblies</td><td>Relays</td><td>Transformers</td></tr>
<tr><td>Inverters</td><td>RTDs</td><td>Transmitters</td></tr>
<tr><td>Isolators</td><td>Sensors</td><td>Transmission Conductors</td></tr>
</table>

BSEP component types eliminated from scoping were:

1. **Lightning Arrestors** – Lightning arrestors are considered part of the “surge arrestors” commodity group. Lightning arrestors do not support a system level intended function and are not within the scope of License Renewal.

2. **Uninsulated Ground Conductors** – Uninsulated ground conductors are electrical conductors (e.g., copper cable, copper bar, steel bar) that are not insulated (i.e., have bare conductors). Uninsulated ground conductors are connected to electrical equipment housings, enclosures and cabinets, as well as, metal structural features such as the cable tray system, building structural steel and concrete reinforcing steel to provide an equipment grounding path for equipment and personnel protection. Uninsulated ground conductors are not relied on to remain functional during or following any design basis event, and they do not perform or support any of the functions required to meet the License Renewal scoping requirements of 10 CFR 54.4(a). Therefore, they do not support a system level intended function and are not within the scope of License Renewal.

2.5.2 APPLICATION OF SCREENING CRITERION 10 CFR 54.21(a)(1)(i) TO ELECTRICAL/I&C COMPONENT COMMODITY GROUPS

Following the identification of the electrical/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 intended functions without moving parts or without a change in configuration or properties.

The following electrical/I&C component commodity groups were determined to meet the screening criteria of 10 CFR 54.21(a)(1)(i).

1. Insulated Cables and Connections (including splices, connectors, fuse holders, and terminal blocks)
2. Electrical portions of Electrical/I&C Penetration Assemblies
3. Phase Bus
4. High-Voltage Insulators
5. Switchyard Bus
6. Transmission Conductors

2.5.3 APPLICATION OF SCREENING CRITERION 10 CFR 54.21(a)(1)(ii) TO ELECTRICAL/I&C COMPONENT COMMODITY GROUPS

The 10 CFR 54.21(a)(1)(ii) screening criterion was applied to the specific component commodity groups that remained following application of the 10 CFR 54.21(a)(1)(i) criterion. 10 CFR 54.21(a)(1)(ii) allows the exclusion of those component commodity groups that are subject to replacement based on a qualified life or specified time period. The only electrical/I&C components identified for exclusion by the criteria of §54.21(a)(1)(ii) are electrical components included in the BSEP Environmental Qualification (EQ) Program. This is because electrical components included in the BSEP EQ Program have defined qualified lives and are replaced prior to the expiration of their qualified lives. No electrical/I&C components within the BSEP EQ Program are subject to aging management review (AMR) in accordance with the screening criteria of §54.21(a)(1)(ii). Therefore, the electrical/I&C components in the EQ Program were screened out. The remaining component commodity groups, i.e., those requiring an AMR, are discussed below.

2.5.3.1 Non-EQ Insulated Cables and Connections

The function of insulated cables and connections is to electrically connect specified sections of an electrical circuit to deliver voltage, current or signals. Electrical cables and their connections are reviewed as a single component commodity group. The types of connections included in this review are splices, connectors, fuse holders, and terminal blocks.

Numerous insulated cables and connections are included in the EQ Program and, therefore, are not subject to an aging management review in accordance with the screening criteria of 10 CFR 54.21(a)(1)(ii). Insulated cables and connections that perform an intended function within the scope of License Renewal, but are not included in the EQ Program, meet the criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review. However, insulated cables and connections inside the enclosure of an active device (e.g., motor leads and connections, and cables and connections internal to relays, chargers, switchgear, transformers, power supplies, etc.) are maintained along with the other subcomponents and piece-parts inside the enclosure and are not subject to aging management review.

The classification of electrical cables and connections into the above two categories, those subject to the EQ Program and those not subject to the EQ Program, is consistent with the classification used in Volume 2, Chapter VI, of the GALL Report, NUREG-1801.

In accordance with NRC ISG-5, fuse holders are passive components and subject to scoping, screening, and aging management review in the same manner as, for example, terminal blocks. However, this position is applicable only if the fuse holders are not part of a larger (active) assembly. BSEP performed a review of fuse holders, using the guidance of ISG-5, and determined that those fuse holders that would require aging management review are part of a larger (active) assembly. Therefore, it was concluded that no fuse holders require an aging management review.

2.5.3.2 Phase Bus

Phase Bus is used to connect two or more elements (electrical equipment such as switchgear and transformers) of an electrical circuit. Isolated phase bus is electrical bus in which each phase conductor is enclosed by an individual metal housing separated from adjacent conductor housings by an air space. Non-segregated phase bus is electrical bus constructed with all phase conductors in a common enclosure without barriers (only air space) between the phases. Phase Bus within scope of License Renewal and subject to aging management review consists of:

- Portions of the isolated phase bus used for backfeeding offsite power to the main transformers and unit auxiliary transformers (UATs) during recovery from an SBO event,
- 4.16 KV, non-segregated phase bus connecting site auxiliary transformer (SAT) #1 disconnect links to 4.16 KV buses 1C and 1D,
- 4.16 KV, non-segregated phase bus connecting SAT #2 disconnect links to 4.16 KV buses 2C and 2D,
- 4.16 KV, non-segregated phase bus connecting UAT #1 to buses 1C and 1D,
- 4.16 KV, non-segregated phase bus connecting UAT #2 to buses 2C and 2D,
- 4.16 KV, non-segregated phase bus connecting emergency switchgear E1 and E2,
- 4.16 KV, non-segregated phase bus connecting emergency switchgear E1 and E3,
- 4.16 KV, non-segregated phase bus connecting emergency switchgear E2 and E4,
- 4.16 KV, non-segregated phase bus connecting emergency switchgear E3 and E4,
- 480V, non-segregated phase bus connecting unit substations E5 and E6, and
- 480V, non segregated phase bus connecting unit substations E7 and E8.

It should be noted that the structural supports for the phase bus housing containing the electrical buses and bus supports are addressed in Section 2.4 as civil/structural commodities.

2.5.3.3 Non-EQ Electrical/I&C Penetration Assemblies

Many electrical/I&C penetration assemblies are included in the EQ Program and, therefore, do not meet the criterion of 10 CFR 54.21(a)(1)(ii) and are not subject to an aging management review.

A review of the remaining, non-EQ, electrical/I&C penetration assemblies determined that most were not in scope for License Renewal because they either did not contain any electrical circuits (such as, spare penetrations) and therefore did not support an electrical intended function, or they did not contain electrical circuits that supported a system-level electrical/I&C intended function for License Renewal. After eliminating these penetration assemblies from further consideration, a small number of non-EQ Program penetrations remained. These were determined to meet the screening criterion of 10 CFR 54.21(a)(1)(ii) and are, therefore, subject to an aging management review.

2.5.3.4 High Voltage Insulators

High voltage insulators are provided on the circuits used to supply power from the switchyard to plant buses during recovery from an SBO. The function of high voltage insulators is to insulate and support electrical conductors. High voltage insulators are passive, long-lived components. Therefore, high voltage insulators meet the criteria of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

2.5.3.5 Switchyard Bus

Switchyard bus provides a portion of the circuits supplying power from the switchyard to plant buses during recovery from an SBO. The function of switchyard bus is to provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals. The switchyard bus is a passive, long-lived component. Therefore, switchyard bus meets the criteria of 10 CFR 54.21(a)(1)(ii) and is subject to an aging management review.

2.5.3.6 Transmission Conductors

Transmission conductors provide a portion of the circuits used to supply power from the switchyard to plant buses during recovery from an SBO. The function of transmission conductors is to provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals. Transmission conductors are passive, long-lived components. Therefore, transmission conductors meet the criteria of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

2.5.4 ELECTRICAL/I&C COMPONENTS REQUIRING AN AGING MANAGEMENT REVIEW

The table below identifies the electrical/I&C component commodity groups requiring an AMR and their intended functions. The AMR results for these components/commodities are provided in Table 3.6.2-1: Electrical and I&C Systems - Summary of Aging Management Evaluation – Electrical and I&C Systems.

TABLE 2.5-1 COMPONENT/COMMODITY GROUPS REQUIRING AGING MANAGEMENT REVIEW AND THEIR INTENDED FUNCTIONS: ELECTRICAL AND I&C SYSTEMS

Component/Commodity	Intended Function(s) (See Table 2.0-1 for function definitions)
Non-EQ Insulated Cables and Connections	E-1 Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals
Phase Bus	E-1 Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals
Electrical portions of non-EQ electrical and I&C penetration assemblies	E-1 Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals
High-voltage insulators	E-2 Insulate and support an electrical conductor
Switchyard Bus	E-1 Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals
Transmission Conductors	E-1 Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals

3.0 AGING MANAGEMENT REVIEW RESULTS

For those structures and components that are identified as being subject to an aging management review, 10 CFR 54.21(a)(3) requires demonstration that the effects of aging will be adequately managed so that their intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation.

This chapter describes the results of the aging management reviews of the structures and components determined, during the scoping and screening processes, to be subject to an aging management review. Organization of this chapter is based on Tables 1 through 6 of Volume 1 of NUREG-1801, Generic Aging Lessons Learned (GALL), dated April 2001 (the GALL Report), and Chapter 3, “Aging Management Review Results,” of NUREG-1800, Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants (SRP-LR), dated April 2001. The major sections of this Chapter are:

3.1 Aging Management of Reactor Vessel, Internals, and Reactor Coolant System

3.2 Aging Management of Engineered Safety Features

3.3 Aging Management of Auxiliary Systems

3.4 Aging Management of Steam and Power Conversion Systems

3.5 Aging Management of Containments, Structures, and Component Supports

3.6 Aging Management of Electrical and Instrumentation and Controls

Most of the Aging Management review (AMR) results information in Chapter 3.0 is presented in two tables of the following type:

Table 3.x.1 – where ‘3’ indicates LRA Chapter 3.0; ‘x’ indicates the section number; and ‘1’ indicates the first table type. For example, in the Reactor Vessel, Internals, and Reactor Coolant System section this table would be numbered 3.1.1 and in the Auxiliary Systems section, this table would be numbered 3.3.1. This table will typically be referred to as “Table 1.”

Table 3.x.2-y – where ‘3’ indicates LRA Chapter 3.0; ‘x’ indicates the section number; ‘2’ indicates the second table type; and ‘y’ indicates the specific system being addressed. For example, within Section 3.1 for the Reactor Vessel, Internals, and Reactor Coolant System, the table number for the Reactor Vessel and Internals would be 3.1.2-1; and for the Neutron Monitoring System, 3.1.2-2. Also, within Section 3.2 for Engineered Safety Features, this table would be 3.2.2-1, for the Residual Heat Removal System; and the next system would have a table numbered 3.2.2-2. This table will typically be referred to as “Table 2.”

<u>Table Description</u>

NUREG-1801, the GALL Report, contains the NRC staff's 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 extended period of operation. The evaluation results documented in the report indicate that many of the existing programs are adequate to manage the aging effects for particular structures or components. The GALL Report also contains recommendations on the specific areas for which existing program should be augmented for license renewal. In order to take full advantage of NUREG-1801, a comparison between the AMR results and the tables of NUREG-1801 has been made. The results of that comparison are provided in tables in this Chapter.

The purpose of Table 1 (refer to Sample Table 1 below) is to provide a summary comparison of specific plant AMR details with the corresponding tables of NUREG-1801, Volume1. The table is essentially the same as Tables 1 through 6 of NUREG-1801, Volume 1, except that the "Type" column has been replaced by an "Item Number" column and the "Item Number in GALL" column has been replaced by a "Discussion" column. The "Item Number" column provides the reviewer with a means to cross-reference from Table 1 to Table 2. The "Discussion" column is used to provide clarifying/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 program being used.
- Exceptions to the GALL Report assumptions.
- A discussion of how the line is consistent with the corresponding line item in NUREG-1801, Volume 1, when it may appear inconsistent.
- A discussion of how the item is different from the corresponding line item in NUREG-1801, Volume 1, when it may appear to be consistent (e.g., when there is exception taken to an aging management program that is listed in NUREG-1801).

The format of Table 1 provides the reviewer with a means of aligning a specific Table 1 row with the corresponding NUREG-1801, Volume 1, table row, thereby allowing for the ease of checking consistency.

Sample Table 1

Table 3.x.1 Summary of Aging Management Evaluations in Chapter __of NUREG-1801 for ______

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.x.1-01					
3.x.1-02					
3.x.1-03					

Table 2 (refer to Sample Table 2 below) provides the detailed results of the aging management reviews for those components/commodities identified in LRA Chapter 2.0 as being subject to aging management review. There will be a Table 2 for each of the systems within a Chapter 3.0 section. Table 2 consists of the following nine columns:

Component/Commodity – The first column identifies the components/commodities from Chapter 2.0 that are subject to aging management review. They are listed in alphabetical order. During the screening process, some structures and components (SCs) were incorporated into commodity groups based on similarity of their design or materials of construction. Use of commodity groups made it possible to address an entire group of SCs with a single evaluation. In the aging management reviews described in the following Sections, further definition of commodity groups was performed based on design, material, environmental, and functional characteristics in order to disposition an entire group with a single aging management review.

Where possible, plant components/commodities were assigned to groups that coincided with NUREG-1801 component/commodity groups in order to facilitate alignment of components with NUREG-1801. The NUREG-1801 nomenclature was used even in cases where BSEP has only a subset of the equipment types listed in NUREG-1801. For example, the NUREG-1801 commodity "Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC)" was used even though BSEP does not have HPCS pumps. This practice also resulted in apparently duplicate entries in system tables for some components/commodities. This was the result of including some equipment in a NUREG-1801 group and also including a similar group for the equipment that did not comport to the NUREG group. As an example, a system may include "Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC)," that included RHR pump casings, and another group entitled "Pumps" that included pump casings that did not correspond to the NUREG-1801 commodity.

Intended Function – The second column contains the license renewal intended functions (including abbreviations where applicable) for the listed component types. Definitions and abbreviations of intended functions are contained in Table 2.0-1.

Material – The third column lists the particular materials of construction for the component/commodity group.

Environment – The fourth column lists the environment to which the component types are exposed. Internal and external service environments are indicated.. The environments used in the BSEP aging management reviews are listed below in Tables 3.0-1 and 3.0-2.

Aging Effect Requiring Management – As part of the aging management review process, aging effects requiring management are identified for material and environment combinations. These are listed in column five. The BSEP aging management review methodology is based on generic industry guidance for determining aging effects for both mechanical and structural components based on the materials of construction and applicable environmental conditions. The material and environment-based rules in the industry guidance documents are derived from known age-related degradation mechanisms and industry operating experience.

Aging Management Programs – The aging management programs used to manage the aging effects requiring management are identified in column six of Table 2. Aging management programs are described in Appendix B.

NUREG-1801, Volume 2, Item – Each combination of component type material environment, aging effect requiring management and aging management program that is listed in Table2, is compared to NUREG-1801, Volume 2, with consideration given to the standard notes, to identify consistencies. When they are identified, consistencies are documented by noting the appropriate NUREG-1801, Volume 2, item number in column seven of Table 2. If there is no corresponding item number in NUREG-1801, Volume 2, this row in column seven is left blank. Thus, a reviewer can readily identify where there is correspondence between the plant-specific tables and the NUREG-1801, Volume 2, tables.

Table 1 Item – Each combination of component, material environment, aging effect requiring management, and aging management program that has an identified NUREG-1801, Volume 2, item number must also have a Table 3.x.1 line item reference number. The corresponding line item from Table 1 is listed in column eight of Table 2. If there is no corresponding item in NUREG-1801, Volume 1, this row in column eight is left blank. Therefore, the information from the two tables can be correlated.

Notes – In order to realize the full benefit of NUREG-1801, each applicant needs to identify how the information in Table 2 aligns with the information in NUREG-1801, Volume 2. This is accomplished through a series of notes. All notes designated with letters are standard notes that will be the same from application to application throughout the industry. Any additional, plant-specific notes will be identified by a number. Plant-specific notes provide information or clarification regarding the aging management review of the Table 2 line item. The generic and plant-specific notes are listed at the end of Sections 3.1 through 3.6. Section 3.1 uses plant specific notes numbered in the 100-series (e.g., 101, 102, etc.). Section 3.2 uses plant-specific notes numbered in the 200-series; Section 3.3, in the 300-series; Section 3.4, in the 400-series; Section 3.5, in the 500-series; and Section 3.6, in the 600-series.

Generic notes A through E indicate that a useful comparison may be made between the Table 2 line item and NUREG-1801. Therefore, items associated with notes A through E will also contain a NUREG-1801 Vol. 2 item and a reference to a Table 1 item.

Sample Table 2

Table 3.x.2-y Section 3 Title–Summary of Aging Management Evaluation–Plant Specific System

Component / Commodity	Intended Function	Material	Environ-ment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes

Table Usage

Each row in Table 1 is evaluated by the reviewer by moving from left to right across the table. No evaluation of information in the Component, Aging effect/Mechanism, Aging Management Program or Further Evaluation Recommended columns is required, as this information is taken directly from NUREG-1801, Volume 1. The Discussion column provides the information of most use to the reviewer and summarizes the information necessary to determine how the aging management review results align with NUREG-1801, Volume 1.

Table 2 provides all the aging management review information for the plant, irrespective of any comparisons to NUREG-1801. In a given row in the table, the reviewer can see the intended function, material, environment, aging effect requiring management, and aging management program combination for a component/commodity type within a system. In addition, a referenced item number in column seven will identify any correlation between the information in Table 2 and that in NUREG-1801, Volume 2. The reviewer can refer to the item number in NUREG-1801, Volume 2, if desired, to verify the correlation. If the column is blank, no correspondence to NUREG-1801, Volume 2 was identified. As the reviewer continues across the table from left to right in a row, the next column is labeled Table 1 Item. If there is a reference number to a corresponding row in Table 1, the reviewer can refer to Table 1 to determine how the aging management program for this combination aligns with NUREG-1801. Table 2 provides a reviewer with a means to navigate from the components subject to an aging management review in LRA Chapter 2.0 through the evaluation of aging management programs used to manage the effects of aging for the components/ commodities.

TABLE 3.0-1 - INTERNAL SERVICE ENVIRONMENTS

Environment [1]	Description
Dry Air/ Gas	Includes dry or humidity-controlled air and gas, such as, instrument air, nitrogen, carbon dioxide, halon, hydrogen, and helium
Treated Water (includes steam)	Treated water is demineralized water and is the base water for all clean, closed loop systems. Depending on the system, treated water may require additional processing. Treated water can be deaerated, include corrosion inhibitors, biocides, or include a combination of these treatments. Steam generated from treated water is included in this environment category.[2] Typical treated water categories include: Reactor Water: BSEP water quality parameters for use in the reactor coolant system. Feedwater, Condensate: BSEP Feedwater/ Condensate water quality parameters for systems that supply feedwater to the reactor coolant system. Treated water – Inhibited: Water treated with corrosion inhibitors and, in some cases, biocides for use in closed cooling water systems. Treated Water – Torus Water: Demineralized water used to fill the Torus.
Raw Water	Raw water is water that enters the plant from a river, lake, pond, ocean, or bay which has not been demineralized. In general, the water has been rough filtered to remove large particles and may contain a biocide additive for control of micro- and macro-organisms. Raw water includes water from the Cape Fear River drawn from the Intake Canal, water drawn from wells, and county water.
Fuel Oil	Fuel oil used in Emergency Diesel Generators, Diesel-driven Fire Pump, and fuel oil storage tanks.
Lubricating Oil	Lubricating oil used in diesel engines, pumps, air compressors, the main turbine, and various lube oil storage tanks. Water contamination of lube oil is not assumed unless indicated by operating experience or design review.
Diesel Exhaust Gas	Used in the exhaust system for diesel generators.

NOTE:
1. Internal environments may also be identified as external environments for certain structures and components.
2. The category "Treated Water (Includes Steam)" does not reflect that a component is exclusively in a steam environment. Rather, this category is broadly used in evaluation groups to represent components that may be exposed to treated water, steam made from treated water, or both.

TABLE 3.0-2 - EXTERNAL SERVICE ENVIRONMENTS

Environment[2]	Description
Outdoor Air/ Exposed to Weather	Atmospheric air, temperature 15 – 93°F, 10 – 100% humidity. Exposed to weather including precipitation and wind. Subject to potential wetted environment.[1] Radiation dose level is negligible.
Indoor Air/ Protected from Weather	Indoor Air/Protected from Weather categories include: Indoor Air - Atmospheric air, specific temperature range/humidity dependent upon building/room/area. Typically, temperature is 104°F maximum in most areas and radiation dose levels are negligible. Potentially wetted.[1] Containment Air - Nitrogen atmosphere (atmospheric air during refueling outages). Specific temperature range dependent upon area. Bulk average temperature 150°F maximum. Relative humidity 40 - 90%. Pressure +2.5/-0.5 psig. Gamma radiation dose level: maximum 60-year total integrated dose (TID) 1.25×10^{8} rad gamma (1.32×10^{10} rad gamma (54 EFPY) at inside face of sacrificial shield wall). Maximum neutron fluence (54 EFPY) of 4.03×10^{17} n/cm^2 (E>1 Mev) inside face of the sacrificial shield wall. Torus Air - Nitrogen atmosphere (atmospheric air during refueling outages). Temperature 110°F maximum. Relative humidity 100%. Pressure +2.5/-0.5 psig. Radiation dose level: maximum 60-year TID 1.25×10^{8} rad gamma.
Buried/Below Grade/ Submerged	Exposed to soil/fill, ground water, or water from the Intake Canal. Except for the immediate vicinity of the Service Water Intake Structure, where aggressive intake water is considered to be present, site groundwater is non-aggressive to concrete as determined by groundwater analysis. Radiation dose level is negligible.
Driven in Un-disturbed Soil	The undisturbed soil environment is associated with structural piles.
Embedded/ Encased	Embedded or encased in concrete.

NOTE:
1. A component is considered susceptible to a wetted environment when it is submerged, has the potential to pool water, subject to external condensation (component temperature is below the ambient dew point), or subject to substantial periods of wetting in an outdoor environment. Location in an outdoor environment alone does not constitute a wetted environment.
2. External environments may also be identified as internal environments for certain structures and components, e.g., HVAC system components.

3.1 AGING MANAGEMENT OF REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

3.1.1 INTRODUCTION

Section 3.1 provides the results of the aging management reviews (AMRs) for those components identified in Subsection 2.3.1, Reactor Vessel, Internals, and Reactor Coolant System, subject to aging management review. The systems or portions of systems are described in the indicated subsections.

1. Reactor Vessel and Internals (Subsection 2.3.1.1)
2. Neutron Monitoring System (NMS) (Subsection 2.3.1.2)
3. Reactor Manual Control System (Subsection 2.3.1.3)
4. Control Rod Drive (CRD) Hydraulic System (Subsection 2.3.1.4)
5. Reactor Coolant Recirculation System (Subsection 2.3.1.5)

Table 3.1.1, Summary of Aging Management Evaluations in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component/ commodity groups in this Section. Table 3.1.1 uses the format of Table 1 described in Section 3.0 above.

3.1.1.1 Operating Experience

The AMR methodology applied at BSEP included use of operating experience (OE) to confirm the set of aging effects that had been predicted through material/environment evaluations. Plant-specific and industry OE through March 18, 2003 was identified and reviewed. OE subsequent to that date will be reviewed and applicable OE will be updated, as required, in conjunction with the amendment to the application required by 10 CFR 54.21(b). The OE review consisted of the following:

Site: BSEP site-specific OE has been captured by a review of the Action Tracking and the Maintenance Rule databases. This effort included a review of work management and leak log records, applicable correspondence (Licensee Event Reports, etc.), and Nuclear Assessment Section assessment records. Based on a review of plant-specific operating experience, as well as industry operating experience, cracking of the Reactor Vessel internal steam dryer is an applicable aging effect and would not have been predicted by the BSEP AMR methodology. Therefore, the aging effect/mechanism combination of cracking due to cyclic loading (flow-induced vibration) has been predicted for the steam dryers. Erosion has occurred on components (flow orifices and pump casings) in the Control Rod Drive Hydraulic System and has been conservatively predicted in the AMR; even though design changes have been made to preclude its occurrence.

Industry: Industry OE has been captured in NUREG-1801, "Generic Aging Lessons Learned (GALL)," and is the primary method for verifying that a complete set of potential aging effects is identified. An evaluation of industry OE published since the effective date of NUREG-1801 was performed to identify any additional aging effects requiring management. This was performed using the Progress Energy internal OE review process which directs the review of OE and requires that it be screened and evaluated for site applicability. OE sources subject to review under this procedure include INPO and WANO items, NRC documents (Information Notices, Generic Letters, Notices of Violation, and staff reports), 10 CFR 21 reports, and vendor bulletins, as well as corporate internal OE information from Progress Energy nuclear sites. The industry OE review identified no additional unpredicted aging effects requiring management, other than cracking of the steam dryers due to flow induced vibration mentioned above, and cracking of neutron flux monitor guide tubes due to irradiation-assisted stress corrosion cracking, which is the subject of General Electric SIL 409, "Incore Dry Tube Cracks."

On-Going On-going review of plant-specific and industry operating experience is continuing to be performed in accordance with the Corrective Action Program and the Progress Energy internal OE review process.

3.1.2 RESULTS

The following tables summarize the results of the aging management review for systems in the Reactor Vessel, Internals, and Reactor Coolant System area.

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Neutron Monitoring System (NMS)

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Manual Control System

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Control Rod Drive (CRD) Hydraulic System

Table 3.1.2-5 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant Recirculation System

These tables use the format of Table 2 described in Section 3.0 above.

3.1.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The materials from which specific components/commodities are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following subsections.

3.1.2.1.1 Reactor Vessel and Internals

Materials

The materials of construction for the Reactor Vessel and Internals components are:

- Aluminum Alloys
- Carbon Steel
- Carbon Steel – Low Alloy Steel
- Cast Austenitic Stainless steel
- Copper Alloys
- Low alloy Steel
- Low Alloy Steel with Stainless Steel and Nickel-Based Alloy Cladding
- Low Alloy Steel with Stainless Steel Cladding
- Nickel-Based Alloys
- Stainless Steel

Environment

The Reactor Vessel and Internals components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Indoor Air with Leaking Treated Water
- Treated Water
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following Reactor Vessel and Internals aging effects require management:

- Cracking
- Flow Blockage
- Loss of Material

- Loss of Pre-load
- Reduction of Fracture Toughness

Aging Management Programs

The following AMPs manage the aging effects for the Reactor Vessel and Internals components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- BWR Stress Corrosion Cracking Program
- Flow-Accelerated Corrosion Program
- One-Time Inspection Program
- Reactor Head Closure Studs Program
- Reactor Vessel and Internals Structural Integrity Program
- Reactor Vessel Surveillance Program
- Systems Monitoring Program
- Water Chemistry Program

3.1.2.1.2 Neutron Monitoring System (NMS)

Materials

The materials of construction for the NMS components are:

- Stainless Steel

Environment

The NMS components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following NMS aging effects require management:

- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the NMS components:

- Reactor Vessel and Internals Structural Integrity Program
- Water Chemistry Program

3.1.2.1.3 Reactor Manual Control System (RMCS)

Materials

The materials of construction for the RMCS components are:

- Stainless Steel

Environment

The RMCS components are exposed to the following:

- Indoor Air
- Treated Water

Aging Effects Requiring Management

The following RMCS aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the RMCS components:

- One-Time Inspection Program
- Water Chemistry Program

3.1.2.1.4 Control Rod Drive (CRD) Hydraulic System

Materials

The materials of construction for the CRD Hydraulic System components are:

- Carbon Steel
- Copper Alloys
- Nickel-Based Alloys
- Stainless Steel

Environment

The CRD Hydraulic System components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Lube Oil
- Treated Water

Aging Effects Requiring Management

The following CRD Hydraulic System aging effects require management:

- Cracking
- Flow Blockage
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the CRD Hydraulic System components:

- Closed-Cycle Cooling Water Program
- One-Time Inspection Program
- Systems Monitoring Program
- Water Chemistry Program

3.1.2.1.5 Reactor Coolant Recirculation System

Materials

The materials of construction for the Reactor Coolant Recirculation System components are:

- Carbon Steel
- Cast Austenitic Stainless steel
- Copper Alloys
- Low Alloy Steel
- Stainless Steel

Environment

The Reactor Coolant Recirculation System components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Treated Water
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following Reactor Coolant Recirculation System aging effects require management:

- Cracking
- Loss of Material
- Loss of Pre-load
- Reduction of Fracture Toughness

Aging Management Programs

The following AMPs manage the aging effects for the Reactor Coolant Recirculation System components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- Bolting Integrity Program
- BWR Stress Corrosion Cracking Program
- Closed-Cycle Cooling Water Program
- Flow-Accelerated Corrosion Program
- One-Time Inspection Program
- Systems Monitoring Program
- Water Chemistry Program

3.1.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the LRA. For the Reactor Vessel, Internals, and Reactor Coolant System, those programs are addressed in the following subsections.

3.1.2.2.1 Cumulative Fatigue Damage (BWR/PWR)

Fatigue is a 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 4.3.

3.1.2.2.2 Loss of Material Due to Crevice and Pitting Corrosion (BWR/PWR)

3.1.2.2.2.1 Steam Generator Shell Crevice and Pitting Corrosion

Loss of material for a steam generator shell assembly is applicable to PWRs only.

3.1.2.2.2.2 Isolation Condenser Crevice and Pitting Corrosion

Loss of material for a BWR isolation condenser is not applicable to BSEP, since BSEP does not have an isolation condenser.

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement (BWR/PWR)

3.1.2.2.3.1 Neutron Irradiation Embrittlement TLAA

Certain aspects of the loss of fracture toughness due to 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). The evaluation of this TLAA is addressed separately in Section 4.2.

3.1.2.2.3.2 Reactor Vessel Embrittlement

Loss of fracture toughness due to neutron irradiation embrittlement could occur in the Reactor Vessel. A materials surveillance program monitors neutron irradiation embrittlement of the Reactor Vessel. The BSEP Reactor Vessel Surveillance Program, and the results of its evaluation for license renewal, are presented in Appendix B.

3.1.2.2.4 Crack Initiation and Growth Due to Thermal and Mechanical Loading or Stress Corrosion Cracking (BWR/PWR)

3.1.2.2.4.1 Small-Bore Reactor Coolant System and Connected System Piping

By letter dated April 20, 2001, BSEP requested approval for Risk Informed Inservice Inspection (RI ISI). Approval was received by letter from R. Correia (USNRC) to J. Keenan (CP&L), dated November 28, 2001: "Brunswick Steam Electric Plant, Unit Nos. 1 and 2 – Safety Evaluation for the Risk Informed Inservice Inspection (RI ISI) Program (TAC Nos. MB1760 and MB1761)" (Accession No. ML013320632). In support of the submittal, evaluations of degradation mechanisms were performed and demonstrated that no locations had a high failure potential on small bore pipe due to Thermal Stratification, Cycling, and Striping (TASCS) and Thermal Transients (TT). The Risk Informed Inservice Inspection Evaluations considered lines greater than 1-inch in diameter. For lines 1-inch and smaller, cracking due to thermal loadings was evaluated and dispositioned as not applicable. Cracking due to mechanical loadings was evaluated by a review of plant-specific operating experience; no relevant operating experience was found. The risk associated with cracking due to stress corrosion cracking of these lines is bounded by those components selected for inservice inspection as part of Risk Informed ISI Program. Therefore, the current inspection methods, as detailed in the ASME Section XI, Subsection IWB, IWC and IWD Program supplemented by the Water Chemistry Program, will manage cracking of small bore piping systems.

3.1.2.2.4.2 Reactor Vessel Flange Leak Detection Line and Jet Pump Sensing Line

The reactor vessel flange leak detection line at BSEP is a Class 2 line that is normally dry. The BSEP AMR methodology assumed that this stainless steel line is exposed to treated water and, therefore, is susceptible to cracking due to stress corrosion cracking.

This aging effect will be managed with a combination of the Water Chemistry Program and the One-Time Inspection Program.

The jet pump sensing lines were evaluated for flow induced vibration as part of the Extended Power Uprate (EPU). This evaluation determined that the sensing line natural frequency of interest is well separated from vane passing frequency of the recirculation pumps at EPU conditions. The failure of a sensing line at any location would be detectable during jet pump surveillance that is done at least daily. Failure of a sensing line does not affect the pressure measurement taken for post-accident water level monitoring. If one or more jet pumps are inoperable, the plant must be brought to Mode 3 within 12 hours. Therefore, no aging management program is required.

3.1.2.2.4.3 Isolation Condenser Components

Cracking of BWR isolation condenser components is not applicable, since BSEP does not have an isolation condenser.

3.1.2.3 Time-Limited Aging Analysis

The Time-Limited Aging Analyses (TLAA) identified below are associated with the Reactor Vessel, Internals, and Reactor Coolant System components. The subsection of the application that contains the TLAA review results is indicated in parenthesis.

1. Neutron Irradiation Embrittlement (Section 4.2, Reactor Vessel Neutron Embrittlement)
2. Loss of Preload due to Stress Relaxation (Section 4.2, Reactor Vessel Neutron Embrittlement)
3. Fatigue (Section 4.3, Metal Fatigue)

3.1.3 CONCLUSIONS

The Reactor Vessel, Internals, and Reactor Coolant System components/commodities having aging effects requiring management have been evaluated, and aging management programs have been selected to manage the aging effects. A description of the aging management programs is provided in Appendix B, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging will be adequately managed so that there is reasonable assurance that the intended functions of Reactor Vessel, Internals, and Reactor Coolant System components/ commodities will be maintained consistent with the current licensing basis during the period of extended operation.

TABLE 3.1.1 SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER IV OF NUREG-1801 FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-01	Reactor coolant pressure boundary components	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue of metal components is addressed as a TLAA in Section 4.3. Refer to Subsection 3.1.2.2.1 for further information.
3.1.1-02	PWR Only				
3.1.1-03	Isolation Condenser	Loss of material due to general, pitting, and crevice corrosion	Inservice inspection; water chemistry	Yes, plant specific	Not applicable; BSEP does not use an isolation condenser. Further discussion is provided in Subsection 3.1.2.2.2.2.
3.1.1-04	Pressure vessel ferritic materials that have a neutron fluence greater than 10^{17} n/cm^2 (E>1 MeV)	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99	Yes, TLAA	Loss of fracture toughness due to neutron irradiation embrittlement. Is addressed as a TLAA in Section 4.2. Further evaluation is documented in Subsection 3.1.2.2.3.1.
3.1.1-05	Reactor vessel beltline shell and welds	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor vessel surveillance	Yes, plant specific	Consistent with NUREG-1801. The BSEP Reactor Vessel Surveillance Program, together with TLAA analyses, is used to manage the aging effects of loss of fracture toughness due to neutron irradiation embrittlement. Further evaluation is documented in Subsection 3.1.2.2.3.2.
3.1.1-06	PWR Only				

TABLE 3.1.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER IV OF NUREG-1801 FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-07	Small-bore reactor coolant system and connected systems piping	Crack initiation and growth due to stress corrosion cracking (SCC), intergranular stress corrosion cracking (IGSCC), and thermal and mechanical loading	Inservice inspection; water chemistry; one-time inspection	Yes, parameters monitored/ inspected and detection of aging effects are to be further evaluated	The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, together with the Water Chemistry Program will be used to manage the effects of cracking in small bore piping. Further evaluation is documented in Subsection 3.1.2.2.4.1.
3.1.1-08	Jet pump sensing line and reactor vessel flange leak detection line	Crack initiation and growth due to SCC, IGSCC, or cyclic loading	Plant specific	Yes, plant specific	Further evaluation is documented in Subsection 3.1.2.2.4.2.
3.1.1-09	Isolation Condenser	Crack initiation and growth due to SCC or cyclic loading	Inservice inspection; water chemistry	Yes, plant specific	Not applicable; as noted in Subsection 3.1.2.2.4.3, BSEP does not use an isolation condenser.
3.1.1-10	PWR Only				
3.1.1-11	PWR Only				
3.1.1-12	PWR Only				
3.1.1-13	PWR Only				
3.1.1-14	PWR Only				
3.1.1-15	PWR Only				
3.1.1-16	PWR Only				

TABLE 3.1.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER IV OF NUREG-1801 FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-17	PWR Only				
3.1.1-18	PWR Only				
3.1.1-19	PWR Only				
3.1.1-20	PWR Only				
3.1.1-21	PWR Only				
3.1.1-22	Reactor vessel closure studs and stud assembly	Crack initiation and growth due to SCC and/or IGSCC	Reactor head closure studs	No	Consistent with NUREG-1801. The BSEP Reactor Head Closure Studs Program is applied to manage potential cracking of the closure stud assemblies.
3.1.1-23	CASS pump casing and valve body	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection	No	Consistent with NUREG-1801. BSEP applies the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program to manage loss of fracture toughness due to thermal embrittlement of reactor recirculation pump casings and valve bodies in the RCS.
3.1.1-24	CASS piping	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS	No	This item is not applicable, since BSEP does not have CASS piping in the RCS. However, the main steam line flow limiters and the reactor coolant recirculation pump discharge flow elements are fabricated from CASS. These components have been assumed to be susceptible to thermal embrittlement. The One-Time Inspection Program has been selected to manage loss of fracture toughness due to thermal embrittlement. However, the need for an AMP may be obviated based on a formal screening for susceptibility in accordance with NUREG-1801.

TABLE 3.1.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER IV OF NUREG-1801 FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-25	BWR piping and fittings; steam generator components	Wall thinning due to flow-accelerated corrosion	Flow-accelerated corrosion	No	Consistent with NUREG-1801 with exceptions. For components subject to FAC, this aging effect/mechanism is managed by the Flow-Accelerated Corrosion Program. The exceptions apply to NUREG-1801 recommendations for Flow Accelerated Corrosion Program implementation.
3.1.1-26	Reactor coolant pressure boundary (RCPB) valve closure bolting, manway and holding bolting, and closure bolting in high pressure and high temperature systems	Loss of material due to wear; loss of preload due to stress relaxation; crack initiation and growth due to cyclic loading and/or SCC	Bolting integrity	No	Consistent with NUREG-1801 with exceptions. The exceptions apply to NUREG-1801 recommendations for aging management program implementation. The BSEP Bolting Integrity Program addresses aging management requirements for bolting on mechanical components within the scope of License Renewal. The Program is based on industry recommendations and EPRI guidance which consider material properties, joint/gasket design, service requirements, and industry/site operating experience in specifying torque and closure requirements, with additional programmatic inspections and requirements as needed to adequately manage aging mechanisms. The Program applies to RCPB bolting except reactor vessel studs for which the Reactor Head Closure Studs Program applies.

TABLE 3.1.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER IV OF NUREG-1801 FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-27	Feedwater and control rod drive (CRD) return line nozzles	Crack initiation and growth due to cyclic loading	Feedwater nozzle; CRD return line nozzle	No	The Reactor Vessel and Internals Structural Integrity Program addresses aging management requirements for the Feedwater and Control Rod Drive Return Line nozzles. The Program is based on BWRVIP-74-A (BWR Reactor Vessel Inspection and Flaw Evaluation Guidelines for License Renewal). This document was approved for use in License Renewal Applications by Safety Evaluation Report dated October 18, 2001. The evaluation of the applicant actions items associated BWRVIP-74-A is presented in Appendix B. Note that the Control Rod Drive Return Line nozzles have been cut and capped. Inservice inspections are performed consistent with ASME Section XI requirements.
3.1.1-28	Vessel shell attachment welds	Crack initiation and growth due to SCC and/or IGSCC	BWR vessel ID attachment welds; water chemistry	No	The Reactor Vessel and Internals Structural Integrity and the Water Chemistry Programs address aging management requirements for the vessel shell attachment welds. See Item Number 3.1.1-27 for a discussion of the Reactor Vessel and Internals Structural Integrity Program.
3.1.1-29	Nozzle safe ends, recirculation pump casing, connected systems piping and fittings, body and bonnet of valves	Crack initiation and growth due to SCC and/or IGSCC	BWR stress corrosion cracking; water chemistry	No	Consistent with NUREG-1801 with exceptions. The aging effects are managed by a combination of the BWR Stress Corrosion Cracking Program and the Water Chemistry Program. Exceptions apply to NUREG-1801 recommendations for Water Chemistry Program implementation.

TABLE 3.1.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER IV OF NUREG-1801 FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-30	Penetrations	Crack initiation and growth due to SCC, IGSCC, and/or cyclic loading	BWR bottom head penetrations; water chemistry	No	The Reactor Vessel and Internals Structural Integrity and the Water Chemistry Programs address aging management of cracking due to stress corrosion cracking for penetrations. Cracking due to cyclic loading is managed only by the Reactor Vessel and Internals Structural Integrity Program. See Item Number 3.1.1-27 for a discussion of the Reactor Vessel and Internals Structural Integrity Program.
3.1.1-31	Core shroud and core plate, support structure, top guide, core spray lines and spargers, jet pump assemblies, control rod drive housing, and nuclear instrumentation guide tubes	Crack initiation and growth due to SCC, IGSCC, and/or IASCC	BWR vessel internals; water chemistry	No	The Reactor Vessel and Internals Structural Integrity and the Water Chemistry Programs address aging management requirements for core shroud and core plate, support structure, top guide, core spray lines and spargers, jet pump assemblies, control rod drive housing, and nuclear instrumentation guide tubes. See Item Number 3.1.1-27 for a discussion of the Reactor Vessel and Internals Structural Integrity Program.
3.1.1-32	Core shroud and core plate access hole cover (welded and mechanical covers)	Crack initiation and growth due to SCC, IGSCC, and/or IASCC	ASME Section XI inservice inspection; water chemistry	No	The Reactor Vessel and Internals Structural Integrity and the Water Chemistry Programs address aging management requirements for core shroud and core plate access hole cover (BSEP has welded covers). See Item Number 3.1.1-27 for a discussion of the Reactor Vessel and Internals Structural Integrity Program.

TABLE 3.1.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER IV OF NUREG-1801 FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1-33	Jet pump assembly castings and orificed fuel support	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal aging and neutron irradiation embrittlement	No	The Reactor Vessel and Internals Structural Integrity Program addresses aging management requirements for jet pump assembly castings and orificed fuel support. See Item Number 3.1.1-27 for a discussion of the Reactor Vessel and Internals Structural Integrity Program.
3.1.1-34	Unclad top head and nozzles	Loss of material due to general, pitting, and crevice corrosion	Inservice inspection; water chemistry	No	Consistent with NUREG-1801 with exceptions involving NUREG-1801 recommendations for implementing the Water Chemistry Program. The aging effects are managed by a combination of the ASME Section XI Subsections IWB, IWC, and IWD and the Water Chemistry Programs.
3.1.1-35	PWR Only				
3.1.1-36	PWR Only				
3.1.1-37	PWR Only				
3.1.1-38	PWR Only				
3.1.1-39	PWR Only				
3.1.1-40	PWR Only				
3.1.1-41	PWR Only				
3.1.1-42	PWR Only				
3.1.1-43	PWR Only				
3.1.1-44	PWR Only				
3.1.1-45	PWR Only				
3.1.1-46	PWR Only				
3.1.1-47	PWR Only				
3.1.1-48	PWR Only				

TABLE 3.1.2-1 REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Top Head Enclosure (Top Head)	M-1	Low Alloy Steel	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry	IV.A1.1-a	3.1.1-34	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.1-b	3.1.1-01	
	M-4	Low Alloy Steel	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry	IV.A1.1-a	3.1.1-34	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.1-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Top Head Enclosure (Nozzles (Vent, Top Head Spray or Reactor Core Isolation Cooling [RCIC], and Spare))	M-1	Low Alloy Steel	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry	IV.A1.1-a	3.1.1-34	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.1-b	3.1.1-01	
Top Head Enclosure (Head Flange)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.1-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Top Head Enclosure (Closure Studs and Nuts)	M-1	Carbon Steel - Low Alloy Steel	Indoor Air Leaking Treated Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Reactor Head Closure Studs			H, 113
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC	Reactor Head Closure Studs	IV.A1.1-c	3.1.1-22	A
Vessel Shell (Vessel Flange)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.2-a	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Vessel Shell (Upper Shell)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.2-a	3.1.1-01	
Vessel Shell (Intermediate Nozzle Shell)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.2-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Vessel Shell (Intermediate Beltline Shell)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.2-b	3.1.1-01	
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Reduction of Fracture Toughness due to Neutron Irradiation Embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99	IV.A1.2-c	3.1.1-04	
					Reactor Vessel Surveillance	IV.A1.2-d	3.1.1-05	A
Vessel Shell (Lower Shell)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.2-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Vessel Shell (Beltline Welds)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.2-b	3.1.1-01	
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Reduction of Fracture Toughness due to Neutron Irradiation Embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99	IV.A1.2-c	3.1.1-04	
					Reactor Vessel Surveillance	IV.A1.2-d	3.1.1-05	A
Vessel Shell (Attachment Welds)	M-1	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.A1.2-e	3.1.1-28	E

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Vessel Shell (Attachment Welds) (continued)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.A1.2-e	3.1.1-28	E
Nozzles (Main Steam)	M-1	Low Alloy Steel	Indoor Air (External)	None	None			G, 109, 120
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry	IV.A1.1-a	3.1.1-34	D, 120
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.3-a	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles (Main Steam) (continued)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109, 120
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 120
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.3-a	3.1.1-01	
Nozzles (Feedwater)	M-1	Low Alloy Steel	Indoor Air (External)	None	None			G, 109, 120
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry	IV.A1.1-a	3.1.1-34	D, 120
				Cracking due to Cyclic Loading	Reactor Vessel and Internals Structural Integrity Program	IV.A1.3-b	3.1.1-27	E, 120
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.3-d	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles (Feedwater) (continued)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109, 120
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 120
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.3-d	3.1.1-01	
Nozzles (Control Rod Drive (CRD) Return Line)	M-1	Low Alloy Steel	Indoor Air (External)	None	None			G, 109, 120
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry	IV.A1.1-a	3.1.1-34	D, 120
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.3-d	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles (Control Rod Drive (CRD) Return Line) (continued)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109, 120
			Treated Water (Includes Steam) (Internal)	AERMs in NUREG-1801 were not determined - See Notes & Referenced NUREG-1801, Volume 2 Item	None - NUREG-1801 AERM(s) is N/A	IV.A1.3-c	3.1.1-27	I, 120, 126
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 120
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.3-d	3.1.1-01	
Nozzles (Recirculation Outlet)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			J, 109, 128
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J, 128
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles (Recirculation Outlet) (continued)	M-1	Nickel Based Alloys	Indoor Air (External)	None	None			J, 101, 128
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J, 128
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
Nozzles (Recirculation Inlet)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			J, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles (Low Pressure Core Spray (LPCS) - Unit 1)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			J, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
Nozzles (Low Pressure Core Spray (LPCS) - Unit 2)	M-1	Low Alloy Steel with Stainless Steel and Nickel-based Alloy Cladding	Indoor Air (External)	None	None			J, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles (Shell Flange)	M-1	Nickel Based Alloys	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking			J
Nozzles Safe Ends (Low Pressure Core Spray (LPCS))	M-1	Nickel Based Alloys	Indoor Air (External)	None	None			G, 101, 129
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103, 129
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.A1.4-a	3.1.1-29	B, 129

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles Safe Ends (Low Pressure Core Spray (LPCS)) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			G, 101, 129
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103, 129
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.A1.4-a	3.1.1-29	B, 129
	M-8	Nickel Based Alloys	Indoor Air (External)	None	None			G, 101, 129
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103, 129
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.A1.4-a	3.1.1-29	B, 129

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles Safe Ends (Low Pressure Core Spray (LPCS)) (continued)	M-8	Stainless Steel	Indoor Air (External)	None	None			G, 101, 129
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103, 129
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.A1.4-a	3.1.1-29	B, 129

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles Safe Ends (CRD Return Line)	M-1	Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.A1.4-a	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.4-b	3.1.1-01	
Nozzles Safe Ends (Recirculating Water (Inlet and Outlet))	M-1	Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.A1.4-a	3.1.1-29	B

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles Safe Ends (Feedwater - Unit 1)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 109, 130
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 113, 130
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.1-c	3.1.1-25	D, 130
		Nickel Based Alloys	Indoor Air (External)	None	None			J, 101, 130
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J, 121, 130
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles Safe Ends (Feedwater - Unit 2)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 109
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 113
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.1-c	3.1.1-25	D
Nozzles Safe Ends (Standby Liquid Control)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Nozzles Safe Ends (Instrumentation)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
Penetrations (CRD Stub Tubes)	M-1	Nickel Based Alloys	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel Internals Structural Integrity			H, 103
				Cracking due to Cyclic Loading	Reactor Vessel Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E
				Cracking due to SCC	Water Chemistry and Reactor Vessel Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.5-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Penetrations (Instrumentation)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109, 128
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel Internals Structural Integrity			H, 103, 128
				Cracking due to Cyclic Loading	Reactor Vessel Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to SCC	Water Chemistry and Reactor Vessel Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.5-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Penetrations (Instrumentation) (continued)	M-1	Nickel Based Alloys	Indoor Air (External)	None	None			G, 101, 128
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel Internals Structural Integrity			H, 103, 128
				Cracking due to Cyclic Loading	Reactor Vessel Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to SCC	Water Chemistry and Reactor Vessel Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.5-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Penetrations (Jet Pump Instrument)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103, 128
				Cracking due to Cyclic Loading	Reactor Vessel Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.5-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Penetrations (Jet Pump Instrument) (continued)	M-1	Nickel Based Alloys	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103, 128
				Cracking due to Cyclic Loading	Reactor Vessel Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.5-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Penetrations (Standby Liquid Control)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103, 128
				Cracking due to Cyclic Loading	Reactor Vessel Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.5-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Penetrations (Standby Liquid Control) (continued)	M-1	Nickel Based Alloys	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103, 128
				Cracking due to Cyclic Loading	Reactor Vessel Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E, 128
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.5-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Penetrations (Flux Monitor)	M-1	Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to Cyclic Loading	Reactor Vessel Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.A1.5-a	3.1.1-30	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.5-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Penetrations (Drain Line)	M-1	Low Alloy Steel	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry	IV.A1.1-a	3.1.1-34	D
				Cracking due to Cyclic Loading	Reactor Vessel Internals Structural Integrity			F
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.5-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Reactor Vessel (Boiling Water Reactor) (Bottom Head)	M-1	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.6-a	3.1.1-01	
	M-4	Low Alloy Steel with Stainless Steel cladding	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.6-a	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Reactor Vessel (Boiling Water Reactor) (Support Skirt and Attachment Welds)	M-1	Low Alloy Steel	Indoor Air (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.7-a	3.1.1-01	135
	M-4	Low Alloy Steel	Indoor Air (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.A1.7-a	3.1.1-01	135
Thermal Sleeves (Feedwater – Unit 1)	M-4	Nickel Based Alloys	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.A1.4-a	3.1.1-29	D
Thermal Sleeves (Feedwater – Unit 2)	M-4	Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.A1.4-a	3.1.1-29	D

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Thermal Sleeves (Low Pressure Core Spray (LPCS))	M-4	Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.A1.4-a	3.1.1-29	D
Core Shroud and Core Plate (Core Shroud (Upper, Central, Lower))	M-1	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to IASCC Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.1-a	3.1.1-31	E

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Core Shroud and Core Plate (Core Shroud (Upper, Central, Lower)) (continued)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to IASCC Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.1-a	3.1.1-31	E
Core Shroud and Core Plate (Core Plate)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to IASCC Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.1-b	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.1-c	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Core Shroud and Core Plate (Core Plate Bolts)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.1-b	3.1.1-31	E
Core Shroud and Core Plate (Access Hole Cover)	M-1	Nickel Based Alloys	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 122, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.1-d	3.1.1-32	E, 122

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Core Shroud and Core Plate (Access Hole Cover) (continued)	M-4	Nickel Based Alloys	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 122, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.1-d	3.1.1-32	E, 122
Core Shroud and Core Plate (Shroud Support Structure)	M-4	Nickel Based Alloys	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.1-f	3.1.1-31	E

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Core Shroud and Core Plate (Core Shroud Repair Hardware)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Loss of Pre-load due to Stress Relaxation	Reactor Vessel and Internals Structural Integrity			J, 123
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to IASCC Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J, 123

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Core Shroud and Core Plate (Core Plate Plugs)	M-1	Nickel Based Alloys	Treated Water (Includes Steam) (External)	Loss of Pre-load due to Stress Relaxation	Reactor Vessel and Internals Structural Integrity Program			J, 124
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to IASCC Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J, 124
		Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Cracking due to IASCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J, 124

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Core Shroud and Core Plate (Core Plate Plugs) (continued)	M-4	Nickel Based Alloys	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to IASCC Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J, 124
		Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Cracking due to IASCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J, 124

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Reactor Vessel Internals (Boiling Water Reactor) (Top Guide)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to IASCC Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.2-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.2-b	3.1.1-01	
Core Spray Lines and Spargers (Core Spray Lines (Headers))	M-1	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.3-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.3-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Core Spray Lines and Spargers (Core Spray Lines (Headers)) (continued)	M-4	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.3-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.3-b	3.1.1-01	
	M-8	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.3-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.3-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Core Spray Lines and Spargers (Spray Rings)	M-1	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.3-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.3-b	3.1.1-01	
	M-4	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.3-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.3-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Core Spray Lines and Spargers (Spray Rings) (continued)	M-8	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.3-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.3-b	3.1.1-01	
Core Spray Lines and Spargers (Spray Nozzles)	M-8	Stainless Steel	Treated Water (Includes Steam) (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103, 114
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.3-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.3-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Core Spray Lines and Spargers (Thermal Sleeves)	M-1	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.3-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.3-b	3.1.1-01	
	M-4	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.3-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.3-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Core Spray Lines and Spargers (Thermal Sleeves) (continued)	M-8	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.3-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.3-b	3.1.1-01	
Jet Pump Assemblies (Thermal Sleeve)	M-4	Nickel Based Alloys	Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.4-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.4-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Jet Pump Assemblies (Thermal Sleeve) (continued)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.4-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.4-b	3.1.1-01	
Jet Pump Assemblies (Inlet Header)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.4-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.4-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Jet Pump Assemblies (Riser Brace Arm)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.4-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.4-b	3.1.1-01	
Jet Pump Assemblies (Holddown Beams)	M-4	Nickel Based Alloys	Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.4-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.4-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Jet Pump Assemblies (Inlet Elbow)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.4-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.4-b	3.1.1-01	
Jet Pump Assemblies (Mixing Assembly)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.4-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.4-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Jet Pump Assemblies (Diffuser)	M-4	Nickel Based Alloys	Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.4-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.4-b	3.1.1-01	
		Stainless Steel	Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.4-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.4-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Jet Pump Assemblies (Castings)	M-4	Cast Austenitic Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to IASCC Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.4-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.4-b	3.1.1-01	
				Reduction of Fracture Toughness due to Neutron Irradiation Embrittlement Reduction of Fracture Toughness due to Thermal Embrittlement	Reactor Vessel and Internals Structural Integrity	IV.B1.4-c	3.1.1-33	E

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Jet Pump Assemblies (Jet Pump Sensing Line)	M-4	Stainless Steel	Treated Water (Includes Steam) (Internal)	AERMs in NUREG-1801 were not determined - See Notes & Referenced NUREG-1801, Volume 2 Item	None - NUREG-1801 AERM(s) is N/A	IV.B1.4-d	3.1.1-08	I, 125
			Treated Water (Includes Steam) (External)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Not Applicable			125
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
Jet Pump Assemblies (Jet Pump Holddown Beam Keeper, Lock Plate, and Bolt)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Fuel Supports and Control Rod Drive (CRD) Assemblies (Orificed Fuel Support)	M-4	Cast Austenitic Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to IASCC Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Reduction of Fracture Toughness due to Neutron Irradiation Embrittlement Reduction of Fracture Toughness due to Thermal Embrittlement	Reactor Vessel and Internals Structural Integrity	IV.B1.5-a	3.1.1-33	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.5-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Fuel Supports and Control Rod Drive (CRD) Assemblies (CRD Housing)	M-1	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.5-c	3.1.1-31	E
	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.5-c	3.1.1-31	E

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Instrumentation (Intermediate Range Monitor (IRM) Dry Tubes)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			G, 104
			Indoor Air (Internal)	None	None			G, 101
			Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to IASCC Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.6-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.6-b	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Instrumentation (Source Range Monitor (SRM) Dry Tubes)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			G, 104
			Indoor Air (Internal)	None	None			G, 101
			Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to IASCC Cracking due to SCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.6-a	3.1.1-31	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.6-b	3.1.1-01	
Reactor Vessel Internals (Boiling Water Reactor - Non-safety Related) (Steam Dryer)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Cyclic Loading	Reactor Vessel and Internals Structural Integrity Program			J, 117
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Reactor Vessel Internals (Boiling Water Reactor - Non-safety Related) (Shroud Head and Separators)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J
Reactor Vessel Internals (Boiling Water Reactor - Non-safety Related) (Feedwater Spargers)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J
Reactor Vessel Internals (Boiling Water Reactor - Non-safety Related) (Surveillance Capsule Holder)	M-4	Stainless Steel	Treated Water (Includes Steam) (External)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			J

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Main Steam)	M-1	Carbon Steel	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	AERMs in NUREG-1801 were not determined - See Notes & Referenced NUREG-1801, Volume 2 Item	None - NUREG-1801 AERM(s) is N/A	IV.C1.1-a	3.1.1-25	I, 115
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 113
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-b	3.1.1-01	
	M-3	Cast Austenitic Stainless Steel	Treated Water (Includes Steam) (Internal)	Reduction of Fracture Toughness due to Thermal Embrittlement	One-Time Inspection			J, 116
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J, 116
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Feedwater)	M-1	Carbon Steel	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.1-c	3.1.1-25	B
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 113
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-d	3.1.1-01	
		Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			F, 119

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1	Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103, 118
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to SCC	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	E, 118
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 118
	M-3	Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103, 118
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to SCC	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	E, 118
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 118

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Reactor Vessel Head Vent Components)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 109
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.1-a	3.1.1-25	D

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body)	M-1	Carbon Steel	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 113
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.3-a	3.1.1-25	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	
		Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.3-c	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body) (continued)	M-7	Carbon Steel	Indoor Air (External)	None	None			G, 109
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 113
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			J, 127
			Treated Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-7	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Valves)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			J, 127
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-7	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping Specialties)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-3	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping Specialties) (continued)	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Piping (Piping and Fittings)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			G, 105
			Indoor Air (External)	None	None			J, 101
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1	Aluminum Alloys	Dry Air / Gas (Internal)	None	None			G, 105
			Indoor Air (External)	None	None			J, 106
		Carbon Steel	Dry Air / Gas (Internal)	None	None			G, 105
		Copper Alloys	Dry Air / Gas (Internal)	None	None			G, 105
			Indoor Air (External)	None	None			J, 106

TABLE 3.1.2-1 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION - REACTOR VESSEL AND INTERNALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Air Receiver (Shell and Access Cover)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			G, 105
			Indoor Air (External)	None	None			J, 101
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E

TABLE 3.1.2-2 REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – NEUTRON MONITORING SYSTEM (NMS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Instrumentation (Incore Neutron Flux Monitor Guide Tubes)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 104
			Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Reactor Vessel and Internals Structural Integrity			H, 103
				Cracking due to SCC Cracking due to IASCC	Water Chemistry and Reactor Vessel and Internals Structural Integrity	IV.B1.6-a	3.1.1-31	E, 102
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.B1.6-b	3.1.1-01	
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 104
			Indoor Air (External)	None	None			J, 101
			Indoor Air (Internal)	None	None			J, 101
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Valves)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 104
			Indoor Air (External)	None	None			J, 101

TABLE 3.1.2-2 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – NEUTRON MONITORING SYSTEM (NMS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping Specialties)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 104
			Indoor Air (External)	None	None			J, 101

TABLE 3.1.2-3 REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR MANUAL CONTROL SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.1.2-4 REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL ROD DRIVE (CRD) HYDRAULIC SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 105
			Indoor Air (External)	None	None			J, 106
		Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.1.2-4 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL ROD DRIVE (CRD) HYDRAULIC SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings) (continued)	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Valves)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.1.2-4 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL ROD DRIVE (CRD) HYDRAULIC SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping Specialties)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Internal)	Loss of Material due to Erosion	One-Time Inspection			J
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.1.2-4 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL ROD DRIVE (CRD) HYDRAULIC SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Hydraulic Control Units (Tanks)	M-1	Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 107
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 104
			Indoor Air (External)	None	None			J, 101
			Treated Water (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Hydraulic Control Units (Rupture Disks)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 104
			Indoor Air (External)	None	None			J, 101
Hydraulic Control Units (Nitrogen Fittings)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 104
			Indoor Air (External)	None	None			J, 101

TABLE 3.1.2-4 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL ROD DRIVE (CRD) HYDRAULIC SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Hydraulic Control Units (Filters)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-2	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Internal)	Cracking due to SCC Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J, 114

TABLE 3.1.2-4 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL ROD DRIVE (CRD) HYDRAULIC SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Hydraulic Control Units (Miscellaneous Piping)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
CRD Pumps (CRD Pump Casing)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Treated Water (Internal)	Loss of Material due to Erosion	One-Time Inspection			J, 131
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J, 131
		Nickel Based Alloys	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J, 131

TABLE 3.1.2-4 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL ROD DRIVE (CRD) HYDRAULIC SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
CRD Pumps (CRD Pump Gearbox Coolers)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Lube Oil (Internal)	None	None			J, 108
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			J
CRD Pumps (CRD Pump Skid Piping and Valves)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Piping (Piping and Fittings)	M-4	Copper Alloys	Indoor Air (External)	None	None			J, 106

TABLE 3.1.2-4 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL ROD DRIVE (CRD) HYDRAULIC SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1	Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 105
			Indoor Air (External)	None	None			J, 106
		Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 105
			Indoor Air (External)	None	None			J, 101
	M-4	Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 105
			Indoor Air (External)	None	None			J, 106
		Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 105
			Indoor Air (External)	None	None			J, 101

TABLE 3.1.2-5 REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR COOLANT RECIRCULATION SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Recirculation)	M-1	Cast Austenitic Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103, 132
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.1-f	3.1.1-29	B, 132
				Reduction of Fracture Toughness due to Thermal Embrittlement	One-Time Inspection	IV.C1.1-g	3.1.1-24	E, 111, 132
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
		Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.1-f	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	

TABLE 3.1.2-5 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR COOLANT RECIRCULATION SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1	Carbon Steel	Indoor Air (External)	None	None			G, 109, 134
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 113, 134
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.1-a	3.1.1-25	D, 134
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 118, 134

TABLE 3.1.2-5 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR COOLANT RECIRCULATION SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Small Bore Piping Less than NPS 4) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to SCC	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	E, 118
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 118

TABLE 3.1.2-5 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR COOLANT RECIRCULATION SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Recirculation Pump (Casing)	M-1	Cast Austenitic Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.2-a	3.1.1-01	
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.2-b	3.1.1-29	B
				Reduction of Fracture Toughness due to Thermal Embrittlement	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C1.2-c	3.1.1-23	A, 110
Recirculation Pump (Cover)	M-1	Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.2-a	3.1.1-01	
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.2-b	3.1.1-29	D

TABLE 3.1.2-5 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR COOLANT RECIRCULATION SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Recirculation Pump (Seal Flange)	M-1	Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.2-a	3.1.1-01	
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.2-b	3.1.1-29	D
Recirculation Pump (Closure Bolting)	M-1	Low Alloy Steel	Indoor Air (External)	Loss of Material due to Wear	Bolting Integrity	IV.C1.2-d	3.1.1-26	B
				Loss of Pre-load due to Stress Relaxation	Bolting Integrity	IV.C1.2-e	3.1.1-26	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.2-f	3.1.1-01	

TABLE 3.1.2-5 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR COOLANT RECIRCULATION SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body)	M-1	Cast Austenitic Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103
				Reduction of Fracture Toughness due to Thermal Embrittlement	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C1.3-b	3.1.1-23	A, 110
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.3-c	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	
		Stainless Steel	Indoor Air (External)	None	None			G, 101
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 103
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.3-c	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	

TABLE 3.1.2-5 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR COOLANT RECIRCULATION SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings)	M-1	Carbon Steel	Indoor Air (External)	None	None	VII.I.1-b	3.3.1-05	I, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J, 103

TABLE 3.1.2-5 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR COOLANT RECIRCULATION SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings) (continued)	M-4	Carbon Steel	Indoor Air (External)	None	None	VII.I.1-b	3.3.1-05	I, 109
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Valves)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J, 103
	M-4	Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 105
			Indoor Air (External)	None	None			J, 112

TABLE 3.1.2-5 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR COOLANT RECIRCULATION SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping Specialties)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J, 103
	M-4	Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 105
			Indoor Air (External)	None	None			J, 112
		Stainless Steel	Indoor Air (External)	None	None			J, 101
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J, 103

TABLE 3.1.2-5 (continued) REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR COOLANT RECIRCULATION SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Reactor Coolant Pressure Boundary (Boiling Water Reactor) (Piping and Fittings (Closed Cooling Water))	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E, 133
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C2.1-a	3.3.1-15	C, 113, 133

Notes for Tables 3.1.2-1 through 3.1.2-4:

Generic Notes:

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E. Consistent with NUREG-1801 for material, environment, and aging effect, but a different AMP is credited.
F. Material not in NUREG-1801 for this component.
G. Environment not in NUREG-1801 for this component and material.
H. Aging effect not in NUREG 1801 for this component, material, and environment combination.
I. Aging effect in NUREG-1801 for this component, material, and environment combination is not applicable.
J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific Notes:

101. The BSEP AMR methodology concluded that stainless steel and nickel-based alloy components in Indoor Air and not subject to aggressive chemical species have no aging effects.
102. NUREG-1801 recommends a combination of XI.M9, "BWR Vessel Internals" and XI.M2, "Water Chemistry" to manage cracking due to SCC, IGSCC, and IASCC. BSEP will use a different combination of programs than recommended by NUREG-1801: (1) the Reactor Vessel and Internals Structural Integrity Program, which is a plant-specific program, and (2) the Water Chemistry Program, which is consistent with NUREG-1801 with exceptions.
103. Loss of material due to crevice and pitting corrosion is predicted by the BSEP AMR methodology but not by NUREG-1801.
104. The BSEP AMR methodology concluded that stainless steel in a nitrogen environment has no aging effects.
105. This commodity identifies the compressed air/gas portion of compressed air systems used for pneumatic controls. The BSEP design includes air dryers to ensure that moisture does not cause corrosion for the components in this item (Ref. NUREG-1801, Section VII.D). The BSEP AMR methodology predicts no aging effects for the subject material in a dry air/gas environment.
106. The BSEP AMR methodology concluded that copper or aluminum alloy components in Indoor Air and not subject to aggressive chemical species have no aging effects.
107. The BSEP AMR methodology concluded that carbon steel in a nitrogen environment has no aging effects.

108. The BSEP AMR methodology concluded that carbon steel in a lube oil environment has no aging effects.
109. The BSEP AMR methodology does not predict loss of material due to general corrosion on the external surfaces of carbon and low-alloy steel structures and components exposed to operating temperatures greater than 212 °F.
110. From the discussion on page XI.M-44 of NUREG-1801:

    "For pump casings and valve bodies, based on the assessment documented in the letter dated May 19, 2000, from Christopher Grimes, Nuclear Regulatory Commission (NRC), to Douglas Walters, Nuclear Energy Institute (NEI), screening for susceptibility to thermal aging is not required. The existing ASME Section XI inspection requirements, including the alternative requirements of ASME Code Case N-481 for pump casings, are adequate for all pump casings and valve bodies."

    Since this component credits ASME Section XI inspection requirements for loss of material due to crevice and pitting corrosion, screening for susceptibility is not performed.
111. The Reactor Coolant Recirculation Pump Discharge Line Flow Elements have been assumed to be susceptible to thermal embrittlement. However, the specified one-time inspection may be obviated based on a formal screening for susceptibility.
112. The BSEP AMR methodology concluded that copper alloys in an indoor environment have no aging effects in the absence of sustained wetting.
113. Loss of material due to general, crevice, and pitting corrosion is predicted by the BSEP AMR methodology but not by NUREG-1801.
114. Flow blockage due to fouling is predicted by the BSEP AMR methodology but not by NUREG-1801.
115. Components exposed to steam with a quality greater than 99.5% are considered resistant to loss of material due to flow-accelerated corrosion by the BSEP AMR methodology.
116. The cast austenitic stainless steel material is only applicable to the Main Steam Flow Limiters.
117. Based on a review of industry operating experience, steam dryers are deemed susceptible to flow-induced vibration. Therefore, cracking due to cyclic loading is an applicable aging effect.
118. BSEP requested and received approval to implement Risk-Informed ISI. In support of the submittal, evaluations of degradation mechanisms were performed; and cracking due to thermal and mechanical loadings was evaluated and dispositioned as not applicable. The risk associated with cracking due to SCC is bounded by those components selected for inservice inspection as part of the Risk-Informed ISI Program. Therefore, the current inspection methods as detailed in the ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD Program, supplemented by the Water Chemistry Program, will manage cracking of small bore piping.
119. The stainless steel material is only applicable to thermowells installed in the feedwater piping.
120. This component is partially clad with stainless steel.
121. The feedwater nozzle safe end on Unit 1 was replaced with a new safe end which allowed welding the feedwater sparger to the safe end. Previously there had been a gap between the nozzle and its thermal sleeve that appeared to be related to feedwater sparger cracking.
122. The Access Hole Covers at BSEP are of a welded design.

123. During Invessel Visual Inspections of the Unit 1 and 2 shrouds, cracking was discovered at various shroud locations. The cracking was severe enough in the H2/H3 weld regions to warrant repair. The H2 and H3 welds join the upper cylindrical shroud section to the slightly smaller diameter middle shroud section via attachment to the outside and inside of the top guide support ring respectively. Plant modifications installed mechanical clamps that will ensure structural integrity to the core shroud at the H2 and H3 welds. The clamps are designed to structurally link the upper shroud section, top guide support ring, and middle shroud section interface, and thereby eliminate the reliance on the H2 and H3 welds for structural integrity.
124. The Unit 1 plugs are of a welded design but the Unit 2 plugs are of a mechanical design. The Unit 2 plug is constructed from SA-276 TP304 for the latch, A276 TP304 for the body, shaft, and pin, and Inconel X-750 for the spring.
125. The jet pump sensing lines were evaluated for flow induced vibration as part of the Extended Power Uprate (EPU). This evaluation determined that the sensing line natural frequency of interest is well separated from vane passing frequency of the recirculation pumps at EPU conditions. The failure of a sensing line at any location would be detectable during jet pump surveillance that is done at least daily. Failure of a sensing line does not affect the pressure measurement taken for post-accident water level monitoring. If one or more jet pumps are inoperable, the plant must be brought to Mode 3 within 12 hours. Therefore, no aging management program is required.
126. The Control Rod Drive (CRD) Return Line has been cut and capped and is therefore not susceptible to cracking due to cyclic loading as discussed in NUREG-0619. NRC Information Notice 2004-08, Reactor Coolant Pressure Boundary Leakage Attributable to Propagation of Cracking in Reactor Vessel Nozzle Welds, was reviewed by BSEP for applicability. The design at BSEP differs significantly from that of the Pilgrim Station. However, recent industry events (particularly at PWRs) regarding Inconel weldments indicated that a review of BSEP programs is appropriate to evaluate possible inclusion in an augmented inspection program. An inspection of the Unit 1 nozzle was performed during the B115R1 outage (Spring 2004) with no indications found. An inspection of the Unit 2 nozzle is planned during the next Unit 2 outage.
127. The SRV Discharge Lines and associated vacuum breaker valves will use the One-Time Inspection Program to manage this aging effect. The one-time inspection will be an ultrasonic examination of the discharge piping section around the suppression chamber waterline.
128. This component is fabricated from low-alloy steel clad with stainless steel and buttered with Inconel.
129. The Unit 1 safe end is fabricated from stainless steel, and the Unit 2 safe end is fabricated from nickel-based alloy.

130 The Unit 1 safe end is bi-metallic and is fabricated from carbon steel and nickel-based alloy.

131 The 1A and 2A CRD Pumps have been replaced with rebuilt pumps with Inconel overlays on the casing to mitigate between-stage erosion degradation.

132 The Reactor Coolant Recirculation Pump Discharge Line Flow Elements are fabricated from Cast Austenitic Stainless Steel.

133 This commodity represents the Reactor Coolant Recirculation Pump Coolers and associated piping that are within the scope of License Renewal due to consideration of spatial interactions.

134 The carbon steel components in this commodity group are associated with the Reactor Vessel drain line.

135 The support skirt is attached to a stainless steel pad on the vessel by stainless steel weld material.

136 Standard Note E applies to Cracking due to SCC, and Standard Note I and Plant-specific Note 118 apply to Cracking due to Thermal and Mechanical Loading.

3.2 AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES

3.2.1 INTRODUCTION

Section 3.2 provides the results of the aging management reviews (AMRs) for those components identified in Subsection 2.3.2, Engineered Safety Features, subject to aging management review. The systems or portions of systems are described in the indicated subsections.

1. Residual Heat Removal (RHR) System (Subsection 2.3.2.1)
2. Containment Isolation System (As discussed in Subsection 2.3.2.2, this system contains no unique components/commodities requiring aging management review.)
3. Containment Atmosphere Control (CAC) System (Subsection 2.3.2.3)
4. High Pressure Coolant Injection (HPCI) System (Subsection 2.3.2.4)
5. Automatic Depressurization System (ADS) (Subsection 2.3.2.5)
6. Core Spray (CS) System (Subsection 2.3.2.6)
7. Standby Gas Treatment System (SGTS) (Subsection 2.3.2.7)
8. Standby Liquid Control (SLC) System (Subsection 2.3.2.8)
9. HVAC Control Building System (Subsection 2.3.2.9)
10. Reactor Protection System (Subsection 2.3.2.10)

Table 3.2.1, Summary of Aging Management Evaluations in Chapter V of NUREG-1801 for Engineered Safety Features, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component/commodity groups in this Section. Table 3.2.1 uses the format of Table 1 described in Section 3.0 above.

3.2.1.1 Operating Experience

The AMR methodology applied at BSEP included use of operating experience (OE) to confirm the set of aging effects that had been predicted through material/environment evaluations. Plant-specific and industry OE through March 18, 2003 was identified and reviewed. OE subsequent to that date will be reviewed and applicable OE will be updated, as required, in conjunction with the amendment to the application required by 10 CFR 54.21(b). The OE review consisted of the following:

Site: BSEP site-specific OE has been captured by a review of the Action Tracking and the Maintenance Rule databases. This effort included a review of work management and leak log records, applicable correspondence (Licensee Event Reports, etc.), and Nuclear Assessment Section assessment records. The review of plant-specific OE identified the following additional aging effects: corrosion of the internal surfaces of the Standby Liquid Control System pump discharge hydraulic accumulators, erosion of Residual Heat Removal System throttle valves, erosion and galvanic corrosion of Residual Heat Removal System service water piping and valves, and flow-accelerated corrosion of drain pots and downstream components of the High Pressure Coolant Injection System.

Industry: Industry OE has been captured in NUREG-1801, "Generic Aging Lessons Learned (GALL)," and is the primary method for verifying that a complete set of potential aging effects is identified. An evaluation of industry OE published since the effective date of NUREG-1801 was performed to identify any additional aging effects requiring management. This was performed using Progress Energy internal OE review process which directs the review of OE and requires that it be screened and evaluated for site applicability. OE sources subject to review under this procedure include INPO and WANO items, NRC documents (Information Notices, Generic Letters, Notices of Violation, and staff reports), 10 CFR 21 reports, and vendor bulletins, as well as corporate internal OE information from Progress Energy nuclear sites. The industry OE review identified no additional unpredicted aging effects requiring management.

On-Going On-going review of plant-specific and industry operating experience is continuing to be performed in accordance with the Corrective Action Program and the Progress Energy internal OE review process.

3.2.2 RESULTS

The following tables summarize the results of the aging management review for systems in the Engineered Safety Features area.

Table 3.2.2-1 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal (RHR) System

Table 3.2.2-2 Engineered Safety Features – Summary of Aging Management Evaluation – Containment Atmosphere Control (CAC) System

Table 3.2.2-3 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection (HPCI) System

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation – Automatic Depressurization System (ADS)

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – Core Spray (CS) System

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management – Evaluation Standby Gas Treatment System (SGTS)

Table 3.2.2-7 Engineered Safety Features – Summary of Aging Management Evaluation – Standby Liquid Control (SLC) System

Table 3.2.2-8 Engineered Safety Features – Summary of Aging Management Evaluation – HVAC Control Building System

Table 3.2.2-9 Engineered Safety Features – Summary of Aging Management Evaluation – Reactor Protection System

These tables use the format of Table 2 described in Section 3.0 above.

3.2.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The materials from which specific components/commodities are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following subsections.

3.2.2.1.1 Residual Heat Removal (RHR) System

Materials

The materials of construction for the RHR System components are:

- Carbon Steel
- Copper Alloys
- Grey Cast Iron
- Insulation
- Stainless Steel

Environment

The RHR System components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Raw Water

- Treated Water
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following RHR System aging effects require management:
- Cracking
- Flow Blockage
- Loss of Heat Transfer Effectiveness
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the RHR System components:
- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- BWR Stress Corrosion Cracking Program
- One-Time Inspection Program
- Open-Cycle Cooling Water System Program
- Preventive Maintenance Program
- Protective Coating Monitoring and Maintenance Program
- Selective Leaching of Materials Program
- Systems Monitoring Program
- Water Chemistry Program

3.2.2.1.2 Containment Atmosphere Control (CAC) System

Materials

The materials of construction for the CAC System components are:
- Carbon Steel
- Copper Alloys
- Glass
- Stainless Steel

Environment

The CAC System components are exposed to the following:
- Dry Air/Gas
- Indoor Air
- Treated Water

Aging Effects Requiring Management

The following CAC System aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the CAC System components:

- One-Time Inspection Program
- Systems Monitoring Program
- Water Chemistry Program

3.2.2.1.3 High Pressure Coolant Injection (HPCI) System

Materials

The materials of construction for the HPCI System components are:

- Carbon Steel
- Copper Alloys
- Glass
- Insulation
- Stainless Steel
- Strainer Element

Environment

The HPCI System components are exposed to the following:

- Indoor Air
- Lube Oil
- Treated Water
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following HPCI System aging effects require management:

- Cracking
- Flow Blockage
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the HPCI System components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- BWR Stress Corrosion Cracking Program
- Flow-Accelerated Corrosion Program
- One-Time Inspection Program
- Preventive Maintenance Program
- Protective Coating Monitoring and Maintenance Program
- Systems Monitoring Program
- Water Chemistry Program

3.2.2.1.4 Automatic Depressurization System (ADS)

Materials

The materials of construction for the ADS components are:

- Stainless Steel

Environment

The ADS components are exposed to the following:

- Dry Air/Gas
- Indoor Air

Aging Effects Requiring Management

The following ADS aging effects require management:

- None

Aging Management Programs

The following AMPs manage the aging effects for the ADS components:

- None

3.2.2.1.5 Core Spray (CS) System

Materials

The materials of construction for the CS System components are:

- Carbon Steel

- Stainless Steel

Environment

The CS System components are exposed to the following:
- Indoor Air
- Treated Water
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following CS System aging effects require management:
- Cracking
- Flow Blockage
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the CS System components:
- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- BWR Stress Corrosion Cracking Program
- One-Time Inspection Program
- Protective Coating Monitoring and Maintenance Program
- Systems Monitoring Program
- Water Chemistry Program

3.2.2.1.6 Standby Gas Treatment System (SGTS)

Materials

The materials of construction for the SGTS components are:
- Carbon Steel
- Elastomers
- Stainless Steel

Environment

The SGTS components are exposed to the following:
- Buried
- Indoor Air

Aging Effects Requiring Management

The following SGTS aging effects require management:

- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the SGTS components:

- Buried Piping and Tanks Inspection Program
- One-Time Inspection Program
- Preventive Maintenance Program
- Systems Monitoring Program

3.2.2.1.7 Standby Liquid Control (SLC) System

Materials

The materials of construction for the SLC System components are:

- Carbon Steel
- Glass
- Plastics/Polymers
- Stainless Steel

Environment

The SLC System components are exposed to the following:

- Indoor Air
- Treated Water
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following SLC System aging effects require management:

- Change in Material Properties
- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the SLC System components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program

- BWR Stress Corrosion Cracking Program
- One-Time Inspection Program
- Preventive Maintenance Program
- Systems Monitoring Program
- Water Chemistry Program

3.2.2.1.8 HVAC Control Building System

Materials

The materials of construction for the HVAC Control Building System components are:

- Aluminum Alloys
- Carbon Steel
- Carbon Steel – Galvanized
- Copper Alloys
- Elastomers
- Glass
- Insulation
- Plastics/Polymers
- Stainless Steel

Environment

The HVAC Control Building System components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Outdoor Air

Aging Effects Requiring Management

The following HVAC Control Building System aging effects require management:

- Cracking
- Loss of Heat Transfer Effectiveness
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the HVAC Control Building System components:

- One-Time Inspection
- Preventive Maintenance Program
- Systems Monitoring Program

3.2.2.1.9 Reactor Protection System

Materials

The materials of construction for the Reactor Protection System components are:

- Stainless Steel

Environment

The Reactor Protection System components are exposed to the following:

- Indoor Air

Aging Effects Requiring Management

The following Reactor Protection System aging effects require management:

- None

Aging Management Programs

The following AMPs manage the aging effects for the Reactor Protection System components:

- None

3.2.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 Provides the basis for identifying those programs that warrant further evaluation by the reviewer in the LRA. For the Engineered Safety Features, those programs are addressed in the following subsections.

3.2.2.2.1 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). Portions of ESF Systems within Class 1 boundaries are considered potentially subject to fatigue damage, as well as HPCI/RCIC steam lines and other susceptible portions of ESF Systems. Class 1 portions of ESF Systems are addressed as part of the Reactor Coolant System in LRA Section 3.1. Evaluation of Fatigue as a TLAA is discussed in Section 4.3.

3.2.2.2.2 Loss of Material Due to General Corrosion

3.2.2.2.2.1 Areas with Stagnant Flow Conditions

Loss of material due to general corrosion is predicted by BSEP for carbon steel components exposed to treated water in ECCS Systems, and is managed by the Water Chemistry and One-Time Inspection Programs. The Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. Since control of water chemistry does not preclude corrosion at locations of stagnant flow conditions, the One-Time Inspection Program will provide a verification of the effectiveness of the Water Chemistry Program to manage loss of material due to general corrosion through examination of carbon steel ECCS components.

3.2.2.2.2.2 Interior and Exterior Surfaces of Carbon Steel Components

The Preventive Maintenance Program is used to manage loss of material on interior surfaces of filter housings and ductwork in the Standby Gas Treatment System.

Loss of material due to external corrosion of carbon steel components is predicted by BSEP for components in air/gas environments exposed to moisture. To manage this aging effect/mechanism, the Systems Monitoring Program will be used. This program provides for scheduled visual inspections to ensure that aging degradation that might lead to loss of intended functions will be detected.

3.2.2.2.3 Local Loss of Material Due to Pitting and Crevice Corrosion

3.2.2.2.3.1 Areas with Stagnant Flow Conditions

Loss of material due to pitting and crevice corrosion is predicted by BSEP for carbon steel components exposed to treated water in ECCS Systems, and is managed by the Water Chemistry and One-Time Inspection Programs. The Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. Since control of water chemistry does not preclude corrosion at locations of stagnant flow conditions, the One-Time Inspection Program will provide a verification of the effectiveness of the Water Chemistry Program to manage loss of material due to pitting and crevice corrosion through examination of carbon steel ECCS components.

3.2.2.2.3.2 Interior and Exterior Surfaces of Carbon and Stainless Steel Components

The Preventive Maintenance Program is used to manage loss of material in filter housings and ductwork in the Standby Gas Treatment System. BSEP has addressed aging management of containment isolation valves and associated piping as a part of the system in which they reside. Generally, this entails, for exterior surfaces, use of the Systems Monitoring Program and use of the Water Chemistry Program in conjunction with the One-Time Inspection Program on the internal surfaces.

3.2.2.2.4 Local Loss of Material Due to Microbiologically Influenced Corrosion

BSEP has addressed aging management of containment isolation valves and associated piping as a part of the system in which they reside. Generally, this entails, for exterior surfaces, use of the Systems Monitoring Program and use of the Water Chemistry Program in conjunction with the One-Time Inspection Program on the internal surfaces. BSEP has no Service Water lines inside the Primary Containment, and MIC is not a significant liability for containment isolation components.

3.2.2.2.5 Changes in Properties Due to Elastomer Degradation

Change in material properties (hardening, cracking) is predicted by the BSEP AMR methodology for elastomeric seals in the Standby Gas Treatment System. The Preventive Maintenance Program will be used to manage aging of the internal surfaces of these seals, whereas the Systems Monitoring Program will be used to manage aging of visible external surfaces.

3.2.2.2.6 Loss of Material Due to Erosion of Charging Pump Flow Orifices

In accordance with NUREG-1800, Section 3.2.2.6, this issue is applicable only to charging pumps in the Chemical and Volume Control Systems of PWRs. Therefore, it is not applicable to BSEP.

3.2.2.2.7 Buildup of Deposits Due to Corrosion in Drywell and Torus Spray Nozzles and Flow Orifices

Suppression Pool (Torus) spray is not required for design basis accidents at BSEP, and is not considered a safety-related function. Drywell spray is required, but is not used in normal operation and is maintained isolated. Therefore, plugging or fouling of Drywell Spray components is not considered an applicable aging effect. Fouling of the ECCS strainers is managed by the Protective Coatings Monitoring and Maintenance Program, which ensures that failed coatings in the Primary Containment will not degrade the capability of ECCS Systems, including RHR and Drywell Spray, below design requirements.

3.2.2.3 Time-Limited Aging Analysis

The Time-Limited Aging Analyses (TLAA) identified below are associated with the ESF systems components. The subsection of the application that contains the TLAA review results is indicated in parenthesis.

1. Fatigue (Section 4.3, Metal Fatigue)

3.2.3 CONCLUSIONS

The Engineered Safety Features components/commodities having aging effects requiring management have been evaluated, and aging management programs have been selected to manage the aging effects. A description of the aging management programs is provided in Appendix B, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging will be adequately managed so that there is reasonable assurance that the intended functions of Engineered Safety Features components/commodities will be maintained consistent with the current licensing basis during the period of extended operation.

TABLE 3.2.1 SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER V OF NUREG-1801 FOR ENGINEERED SAFETY FEATURES

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-01	Piping, fittings, and valves in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue of metal components is addressed as a TLAA in Section 4.3. Further evaluation is documented in Subsection 3.2.2.2.1.
3.2.1-02	Piping, fittings, pumps, and valves in emergency core cooling system	Loss of material due to general corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	Consistent with NUREG-1801 with exceptions. Aging effects are managed by the combination of the Water Chemistry and One Time Inspection Programs. Exceptions apply to NUREG-1801 recommendations for Water Chemistry Program and One-Time Inspection Program implementation. Further evaluation is documented in Subsection 3.2.2.2.2.1.
3.2.1-03	Components in containment spray (PWR only), standby gas treatment system (BWR only), containment isolation, and emergency core cooling systems	Loss of material due to general corrosion	Plant specific	Yes, plant specific	The plant-specific AMPs used to manage the aging effect are the Preventive Maintenance Program and the Systems Monitoring Program. Also refer to Item 3.2.1-10. Further evaluation is documented in Subsection 3.2.2.2.2.2.

TABLE 3.2.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER V OF NUREG-1801 FOR ENGINEERED SAFETY FEATURES

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-04	Piping, fittings, pumps, and valves in emergency core cooling system	Loss of material due to pitting and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	Consistent with NUREG-1801 with exceptions. Aging effects are managed by the combination of the Water Chemistry and One Time Inspection Programs. Exceptions apply to NUREG-1801 recommendations for Water Chemistry Program and One-Time Inspection Program implementation. Further evaluation is documented in Subsection 3.2.2.2.3.1.
3.2.1-05	Components in containment spray (PWR only), standby gas treatment system (BWR only), containment isolation, and emergency core cooling systems	Loss of material due to pitting and crevice corrosion	Plant specific	Yes, plant specific	The plant-specific AMPs used to manage the aging effect are the Preventive Maintenance Program. Systems Monitoring Program and the One-Time Inspection Program. Further evaluation is documented in Subsection 3.2.2.2.3.2.
3.2.1-06	Containment isolation valves and associated piping	Loss of material due to microbiologically influenced corrosion (MIC)	Plant specific	Yes, plant specific	In general, BSEP applies the Systems Monitoring Program for external surfaces and the combination of Water Chemistry and One-Time Inspection Programs for internal surfaces. Further evaluation is documented in Subsection 3.2.2.2.4.
3.2.1-07	Seals in standby gas treatment system	Changes in properties due to elastomer degradation	Plant specific	Yes, plant specific	The plant-specific AMPs used to manage the aging effect are the Preventive Maintenance and the Systems Monitoring Programs. Further evaluation is documented in Subsection 3.2.2.2.5.
3.2.1-08	PWR Only				

TABLE 3.2.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER V OF NUREG-1801 FOR ENGINEERED SAFETY FEATURES

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-09	Drywell and suppression chamber spray system nozzles and flow orifices	Plugging of flow orifice and spray nozzles by general corrosion products	Plant specific	Yes, plant specific	As discussed in Subsection 3.2.2.2.7, plugging/ fouling of spray nozzles by corrosion products is not considered to be an applicable aging effect/mechanism.
3.2.1-10	External surface of carbon steel components	Loss of material due to general corrosion	Plant specific	Yes, plant specific	Consistent with NUREG-1801. The plant-specific AMP used to manage the aging effect is the Systems Monitoring Program. Further evaluation is documented in Subsection 3.2.2.2.2.2.
3.2.1-11	Piping and fittings of CASS in emergency core cooling systems	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS	No	Not applicable; BSEP has no CASS components susceptible to thermal aging embrittlement in ESF Systems.
3.2.1-12	Components serviced by open-cycle cooling system	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling; buildup of deposit due to biofouling	Open-cycle cooling water system	No	Consistent with NUREG-1801. BSEP employs the Open Cycle Cooling Water System Program to manage the aging effects.
3.2.1-13	Components serviced by closed-cycle cooling system	Loss of material due to general, pitting, and crevice corrosion	Closed-cycle cooling water system	No	Not applicable; BSEP Closed Cycle Cooling Water Systems do not provide essential cooling to safety related heat loads of ESF Systems.

TABLE 3.2.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER V OF NUREG-1801 FOR ENGINEERED SAFETY FEATURES

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1-14	Emergency core cooling system valves and lines to and from high-pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) pump turbines	Wall thinning due to flow-accelerated corrosion	Flow-accelerated corrosion	No	Consistent with NUREG-1801. Aging effects are managed by the FAC Program.
3.2.1-15	PWR Only				
3.2.1-16	Pumps, valves, piping and fittings in emergency core cooling system	Crack initiation and growth due to SCC and IGSCC	Water chemistry and BWR stress corrosion cracking	No	Consistent with NUREG-1801 with exceptions. Aging effects managed by the Water Chemistry and BWR Stress Corrosion Cracking Programs. Exceptions apply to the NUREG-1801 recommendations for Water Chemistry Program implementation.
3.2.1-17	PWR Only				
3.2.1-18	Closure bolting in high-pressure or high-temperature systems	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and/or SCC	Bolting integrity	No	Not applicable; non-Class 1 closure bolting is considered to be a subcomponent of the associated component. ESF Systems do not use high-strength pressure boundary bolting. Bolting materials were not itemized as a separate component. Therefore, a bolting integrity program is not credited for aging management. The AMP credited for visual identification of external general corrosion (Systems Monitoring Program) will also address bolting materials.

TABLE 3.2.2-1 ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Low Pressure Coolant Injection (LPCI) System)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.1-f	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
Valves (Body)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Low-Pressure Coolant Injection (LPCI) and Residual Heat Removal (RHR))	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	B
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	V.D2.1-c	3.2.1-16	B
	M-4	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	B

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Lines to Suppression Chamber (SC))	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	B
Piping and Fittings (Lines to Drywell and Suppression Chamber Spray System (DSCSS))	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	B

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Piping specialties)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-3	Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 215
	M-6	Insulation	Indoor Air (External)	None	None			J, 228

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Misc. auxiliary and drain piping and valves)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-4	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Piping and Fittings (restrictive orifices / flow elements)	M-1	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	V.D2.1-c	3.2.1-16	D

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (restrictive orifices / flow elements) (continued)	M-3	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	V.D2.1-c	3.2.1-16	D
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Bowl/Casing)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Suction Head)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Discharge Head)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B
Valves (Check, Control, Hand, Motor Operated, and Relief Valves) (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.3-b	3.2.1-02 3.2.1-04	B
			Treated Water (Internal)	Loss of Material due to Erosion	One-Time Inspection			J, 218
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	V.D2.3-c	3.2.1-16	B

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Check, Control, Hand, Motor Operated, and Relief Valves) (Body and Bonnet) (continued)	M-4	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.3-b	3.2.1-02 3.2.1-04	B
Heat Exchangers (RHR and LPCI) (Tubes)	M-1	Copper Alloys	Raw Water (Internal)	Loss of Material due to Erosion Loss of Material due to MIC	Open-Cycle Cooling Water System			J
			Treated Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
	M-5	Copper Alloys	Raw Water (Internal)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Open-Cycle Cooling Water System			J
			Treated Water (External)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Open-Cycle Cooling Water System			J

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Heat Exchangers (RHR and LPCI) (Tubesheet)	M-1	Copper Alloys	Raw Water (Internal)	Loss of Material due to Erosion Loss of Material due to MIC	Open-Cycle Cooling Water System			J
			Treated Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
	M-5	Copper Alloys	Raw Water (Internal)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Open-Cycle Cooling Water System			J
			Treated Water (External)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Open-Cycle Cooling Water System			J
Heat Exchangers (RHR and LPCI) (Channel Head)	M-1	Copper Alloys	Raw Water (Internal)	Loss of Material due to Erosion Loss of Material due to MIC	Open-Cycle Cooling Water System			J
Heat Exchangers (RHR and LPCI) (Shell)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Heat Exchangers (RHR and LPCI) (Shell) (continued)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	V.D2.4-a	3.2.1-12	A
Drywell and Suppression Chamber Spray System (DSCSS) (Piping and Fittings)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Drywell and Suppression Chamber Spray System (DSCSS) (Spray Nozzles)	M-1	Carbon Steel	Dry Air/Gas (Internal)	None	None			J
	M-8	Carbon Steel	Dry Air/Gas (Internal)	None	None			J, 229
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers)	M-1	Carbon Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J, 203
				Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers) (continued)	M-1	Stainless Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-2	Carbon Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J, 203
				Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J, 203
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E
Piping (Piping and Fittings)	M-1	Carbon Steel	Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings) (continued)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 217
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A
				Loss of Material due to Selective Leaching	Selective Leaching of Materials	VII.C1.1-a	3.3.1-29	B
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A
	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 217
			Raw Water (Internal)	Loss of Material due to Erosion	Open-Cycle Cooling Water System			H
				Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.2-a	3.3.1-17	E
				Loss of Material due to Selective Leaching	Selective Leaching of Materials	VII.C1.2-a	3.3.1-29	E
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.2-a	3.3.1-17	E

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Heat Exchanger (Shell)	M-1	Grey Cast Iron	Treated Water (Internal)	Loss of Material due to Galvanic Corrosion	Preventive Maintenance			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Heat Exchanger (Channel Head and Access Cover)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 223
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.3-a	3.3.1-17	A
				Loss of Material due to Selective Leaching	Selective Leaching of Materials	VII.C1.3-a	3.3.1-29	B

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Heat Exchanger (Tubes)	M-1	Copper Alloys	Raw Water (Internal)	Loss of Material due to MIC	Open-Cycle Cooling Water System	VII.C1.3-a	3.3.1-17	A
				Loss of Material due to Erosion Loss of Material due to Galvanic Corrosion	Open-Cycle Cooling Water System			H
		Stainless Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System			J
			Treated Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-5	Copper Alloys	Indoor Air (External)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Preventive Maintenance			J
			Raw Water (Internal)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Open-Cycle Cooling Water System	VII.C1.3-b	3.3.1-17	A
		Stainless Steel	Raw Water (Internal)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Open-Cycle Cooling Water System			J

TABLE 3.2.2-1 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – RESIDUAL HEAT REMOVAL (RHR) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pump (Casing)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System			F

TABLE 3.2.2-2 ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CONTAINMENT ATMOSPHERE CONTROL (CAC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Containment Atmospheric Dilution/Control System (Valves)	M-1	Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			J
		Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (External)	None	None			J, 223
			Indoor Air (Internal)	None	None			J, 223
		Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (External)	None	None			J, 215
			Treated Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-4	Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			J

TABLE 3.2.2-2 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CONTAINMENT ATMOSPHERE CONTROL (CAC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Containment Atmospheric Dilution/Control System (Valves) (continued)	M-4	Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (External)	None	None			J, 223
		Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Containment Atmospheric Dilution/Control System (Piping and Fittings)	M-1	Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 221
		Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-4	Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 221
		Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (External)	None	None			J, 215

TABLE 3.2.2-2 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CONTAINMENT ATMOSPHERE CONTROL (CAC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Containment Atmospheric Dilution/Control System (Piping Specialties)	M-1	Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 221
		Glass	Indoor Air (External)	None	None			J, 202
			Treated Water (Internal)	None	None			J, 222
		Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-2	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			J
	M-3	Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 221
	M-4	Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (External)	None	None			J, 215

TABLE 3.2.2-2 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CONTAINMENT ATMOSPHERE CONTROL (CAC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Containment Atmospheric Dilution/Control System (Tanks)	M-1	Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 221
		Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Containment Atmospheric Dilution/Control System (Pumps)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 221
			Indoor Air (External)	None	None			J, 215
Containment Atmospheric Dilution/Control System (Heat Exchangers)	M-1	Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 207, 221
		Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 208, 221
			Indoor Air (External)	None	None			J, 208, 215
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E

TABLE 3.2.2-3 ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (High Pressure Coolant Injection (HPCI) System)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.1-a	3.1.1-25	D
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-e	3.1.1-01	
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			F
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.1-f	3.1.1-29	D

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (High Pressure Coolant Injection (HPCI) System) (continued)	M-3	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			F
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.1-f	3.1.1-29	D
Piping and Fittings (Steam Line to HPCI and RCIC Pump Turbine)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 226
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to SCC	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	E, 226
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 226

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.3-a	3.1.1-25	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.3-c	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (High Pressure Coolant Injection (HPCI))	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	
				Cracking due to SCC	Water Chemistry and One-Time Inspection	V.D2.1-c	3.2.1-16	E, 230
Piping and Fittings (Lines to Suppression Chamber (SC))	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	B

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Lines to HPCI and RCIC Pump Turbine)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	D
Piping and Fittings (Lines from HPCI and RCIC Pump Turbines to Torus or Wetwell)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	D
Piping and Fittings (Piping specialties)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Lube Oil (Internal)	None	None			J, 220
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Piping specialties) (continued)	M-1	Glass	Indoor Air (External)	None	None			J, 202
			Treated Water (Internal)	None	None			J, 222
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-2	Carbon Steel	Lube Oil (Internal)	None	None			J, 220
	M-6	Insulation	Indoor Air (External)	None	None			J, 228
Piping and Fittings (Misc. auxiliary and drain piping and valves)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Lube Oil (Internal)	None	None			J, 220
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Misc. auxiliary and drain piping and valves) (continued)	M-4	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Piping and Fittings (restrictive orifices / flow elements)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			J
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.1-a	3.1.1-25	D
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Lube Oil (Internal)	None	None			J, 220
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (restrictive orifices / flow elements) (continued)	M-3	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Lube Oil (Internal)	None	None			J, 220
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Bowl/Casing)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Suction Head)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Discharge Head)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Check, Control, Hand, Motor Operated, and Relief Valves) (Body and Bonnet)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Lube Oil (Internal)	None	None			J, 220
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated per 10 CFR 54.21(c)			
				Loss of Material due to FAC	Flow-Accelerated Corrosion	V.D2.3-a	3.2.1-14	B
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.3-b	3.2.1-02 3.2.1-04	B
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
		Strainer Element	Treated Water (Internal)	Flow Blockage due to Fouling	Preventive Maintenance			J, 225
	M-4	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.3-b	3.2.1-02 3.2.1-04	B

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Emergency Core Cooling System (BWR) (Auxiliary Pumps)	M-1	Carbon Steel	Lube Oil (Internal)	None	None			J, 220
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Emergency Core Cooling System (BWR) (Misc. Tanks and Vessels)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Lube Oil (Internal)	None	None			J, 220
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.1-a	3.1.1-25	D
	M-4	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Emergency Core Cooling System (BWR) (Steam Turbines)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Auxiliary Heat Exchangers (Auxiliary Heat Exchanger tubing)	M-1	Copper Alloys	Lube Oil (External)	None	None			J, 220
			Lube Oil (Internal)	None	None			J, 220
	M-5	Copper Alloys	Lube Oil (External)	None	None			J, 220
			Lube Oil (Internal)	None	None			J, 220
Auxiliary Heat Exchangers (Auxiliary Heat Exchanger shell / housing)	M-1	Carbon Steel	Lube Oil (Internal)	None	None			J, 220
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Auxiliary Strainers/Filters (Auxiliary Strainer Element)	M-2	Strainer Element	Lube Oil (Internal)	Flow Blockage due to Fouling	Preventive Maintenance			J
Auxiliary Strainers/Filters (Auxiliary Strainer Housing)	M-1	Carbon Steel	Lube Oil (Internal)	None	None			J, 220
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers)	M-1	Carbon Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J, 203
				Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.2.2-3 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers) (continued)	M-2	Carbon Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J, 203
				Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E

TABLE 3.2.2-4 ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – AUTOMATIC DEPRESSURIZATION SYSTEM (ADS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			F, 214
Non-Carbon Steel Components (External Surfaces)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 201

TABLE 3.2.2-5 ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CORE SPRAY (CS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Low Pressure Core Spray (LPCS) System)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.1-f	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	

TABLE 3.2.2-5 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CORE SPRAY (CS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Low Pressure Core Spray (LPCS) System) (continued)	M-3	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.1-f	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to SCC	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	E, 226
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 226

TABLE 3.2.2-5 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CORE SPRAY (CS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H

TABLE 3.2.2-5 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CORE SPRAY (CS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body) (continued)	M-1	Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.3-c	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	
	M-4	Carbon Steel	Indoor Air (External)	None	None			J, 219
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
Piping and Fittings (Low-Pressure Core Spray (LPCS))	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	B

TABLE 3.2.2-5 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CORE SPRAY (CS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Low-Pressure Core Spray (LPCS)) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	V.D2.1-c	3.2.1-16	B
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
Piping and Fittings (Lines to Suppression Chamber (SC))	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	B
Piping and Fittings (Piping specialties)	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F

TABLE 3.2.2-5 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CORE SPRAY (CS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Misc. auxiliary and drain piping and valves)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	One-Time Inspection			J, 205
	M-4	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	One-Time Inspection			J, 205
Piping and Fittings (restrictive orifices / flow elements)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
	M-3	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F

TABLE 3.2.2-5 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CORE SPRAY (CS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Bowl/Casing)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Suction Head)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Discharge Head)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B

TABLE 3.2.2-5 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CORE SPRAY (CS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Check, Control, Hand, Motor Operated, and Relief Valves) (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.3-b	3.2.1-02 3.2.1-04	B
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion	Water Chemistry and One-Time Inspection			F
	M-4	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.3-b	3.2.1-02 3.2.1-04	B

TABLE 3.2.2-5 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CORE SPRAY (CS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers)	M-1	Carbon Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J, 203
				Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J, 203
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-2	Carbon Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J, 203
				Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.2.2-5 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – CORE SPRAY (CS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers) (continued0	M-2	Stainless Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J, 203
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E

TABLE 3.2.2-6 ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT – EVALUATION STANDBY GAS TREATMENT SYSTEM (SGTS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Ductwork (Equipment Frames and Housing)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	V.B.1-a	3.2.1-03	E
Filters (Housing and Supports)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	V.B.2-a	3.2.1-03	E
Filters (Elastomer Seals)	M-1	Elastomers	Indoor Air (External)	Loss of Material due to Wear	Systems Monitoring			H
				Cracking due to Various Degradation Mechanisms	Systems Monitoring	V.B.2-b	3.2.1-07	E
			Indoor Air (Internal)	Loss of Material due to Wear	Preventive Maintenance			H
				Cracking due to Various Degradation Mechanisms	Preventive Maintenance	V.B.2-b	3.2.1-07	E
Standby Gas Treatment System (Boiling Water Reactor) (Piping)	M-1	Carbon Steel	Buried (External)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Buried Piping and Tanks Inspection			J
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			J
	M-4	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			J

TABLE 3.2.2-6 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT – EVALUATION STANDBY GAS TREATMENT SYSTEM (SGTS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Standby Gas Treatment System (Boiling Water Reactor) (Valves)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			J
	M-4	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			J
Standby Gas Treatment System (Boiling Water Reactor) (Piping Specialties)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Indoor Air (Internal)	None	None			J, 215
	M-3	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Indoor Air (Internal)	None	None			J, 215
	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Indoor Air (Internal)	None	None			J, 215
Standby Gas Treatment System (Boiling Water Reactor) (Instrument Tubing)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Indoor Air (Internal)	None	None			J, 215
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E

TABLE 3.2.2-7 ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – STANDBY LIQUID CONTROL (SLC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Lines to Reactor Water Cleanup (RWC) and Standby Liquid Control (SLC) Systems)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.1-f	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to SCC	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	E, 226
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 226
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-i	3.1.1-07	

TABLE 3.2.2-7 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – STANDBY LIQUID CONTROL (SLC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.3-c	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E
Piping (Piping and Fittings)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H

TABLE 3.2.2-7 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – STANDBY LIQUID CONTROL (SLC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings) (continued)	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H
Piping (Piping specialties)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Preventive Maintenance			J, 206
		Glass	Indoor Air (External)	None	None			J, 202
			Treated Water (Internal)	None	None			J, 222
		Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H
Solution Storage (Tank)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H

TABLE 3.2.2-7 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – STANDBY LIQUID CONTROL (SLC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Pump Suction, Relief, Injection, Containment Isolation, and Explosive Actuated Discharge) (Body and Bonnet)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H
Injection Pumps (Casing)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 215
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H
Standby Liquid Control System (Boiling Water Reactor) (Hydraulic Accumulator Tank)	M-1	Plastics / Polymers	Indoor Air (Internal)	Cracking due to Various Degradation Mechanisms	Preventive Maintenance			J, 227
			Treated Water (External)	Change in Material Properties due to Various Degradation Mechanisms	Preventive Maintenance			J, 227

TABLE 3.2.2-8 ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC CONTROL BUILDING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.D.1-a	3.3.1-19	E, 209
		Carbon Steel - Galvanized	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance			F
		Copper Alloys	Dry Air/Gas (Internal)	None	None			G, 216, 214
		Plastics / Polymers	Indoor Air (Internal)	Cracking due to Various Degradation Mechanisms	Preventive Maintenance			F
		Stainless Steel	Dry Air/Gas (Internal)	None	None			G, 214
	M-3	Copper Alloys	Dry Air/Gas (Internal)	None	None			G, 214
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1	Aluminum Alloys	Dry Air/Gas (Internal)	None	None			J, 214
		Copper Alloys	Dry Air/Gas (Internal)	None	None			J, 216, 214
		Plastics / Polymers	Indoor Air (Internal)	Cracking due to Various Degradation Mechanisms	Preventive Maintenance			F
		Stainless Steel	Dry Air/Gas (Internal)	None	None			J, 214

TABLE 3.2.2-8 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC CONTROL BUILDING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (including check valves and containment isolation) (Body and Bonnet) (continued)	M-4	Copper Alloys	Dry Air/Gas (Internal)	None	None			J, 216, 214
Air Receiver (Shell and Access Cover)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.D.3-a	3.3.1-19	E, 209
Filter (Shell and Access Cover)	M-1	Copper Alloys	Dry Air/Gas (Internal)	None	None			G, 214
Dryer (Shell and Access Cover)	M-1	Copper Alloys	Dry Air/Gas (Internal)	None	None			J, 214
Duct (Duct Fittings, Access Doors, Damper Housings and Closure Bolts)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.F1.1-a	3.3.1-05	E, 210
			Outdoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance			G, 210

TABLE 3.2.2-8 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC CONTROL BUILDING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Duct (Duct Fittings, Access Doors, Damper Housings and Closure Bolts) (continued)	M-1	Carbon Steel - Galvanized	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.F1.1-a	3.3.1-05	E, 210
			Outdoor Air (Internal)	Loss of Material due to Aggressive Chemical Attack Loss of Material due to General Corrosion	Preventive Maintenance			G
		Stainless Steel	Indoor Air (Internal)	None	None			F, 201
Duct (Equipment Frames and Housings, including Fan Housings)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.F1.1-a	3.3.1-05	E, 210
			Outdoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance			G
	M-4	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.F1.1-a	3.3.1-05	E, 210
Duct (Flexible Collars between Ducts and Fans)	M-1	Elastomers	Indoor Air (Internal)	Cracking due to Various Degradation Mechanisms	Preventive Maintenance	VII.F1.1-b	3.3.1-02	E
				Loss of Material due to Wear	Preventive Maintenance	VII.F1.1-c	3.3.1-02	E

TABLE 3.2.2-8 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC CONTROL BUILDING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Duct (Seals in Dampers and Doors)	M-1	Elastomers	Indoor Air (Internal)	Cracking due to Various Degradation Mechanisms	Preventive Maintenance	VII.F1.1-b	3.3.1-02	E
				Loss of Material due to Wear	Preventive Maintenance	VII.F1.1-c	3.3.1-02	E
Air Handler Heating/Cooling (Heating/Cooling Coils)	M-1	Copper Alloys	Dry Air/Gas (Internal)	None	None			G, 216
	M-4	Carbon Steel - Galvanized	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance			F
	M-5	Copper Alloys	Dry Air/Gas (Internal)	None	None			G, 216
Piping (Piping and Fittings)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			G
		Copper Alloys	Dry Air/Gas (Internal)	None	None			G, 216, 214
		Glass	Dry Air/Gas (Internal)	None	None			F, 216
		Plastics/ Polymers	Indoor Air (Internal)	Cracking due to Various Degradation Mechanisms	One-Time Inspection			F

TABLE 3.2.2-8 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC CONTROL BUILDING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings) (continued)	M-1	Stainless Steel	Indoor Air (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	One-Time Inspection			F
	M-4	Copper Alloys	Dry Air/Gas (Internal)	None	None			G, 216, 214
Filters (Housing and Supports)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.F1.4-a	3.3.1-05	E, 210
		Carbon Steel - Galvanized	Indoor Air (Internal)	None	None			F, 211
		Copper Alloys	Indoor Air (Internal)	None	None			F, 201
		Stainless Steel	Indoor Air (Internal)	None	None			F, 201
	M-4	Carbon Steel - Galvanized	Indoor Air (Internal)	None	None			F, 201
			Outdoor Air (Internal)	Loss of Material due to Aggressive Chemical Attack Loss of Material due to General Corrosion	Preventive Maintenance			G

TABLE 3.2.2-8 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC CONTROL BUILDING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Filters (Elastomer Seals)	M-1	Elastomers	Indoor Air (Internal)	Loss of Material due to Wear	Preventive Maintenance			H
				Cracking due to Various Degradation Mechanisms	Preventive Maintenance	VII.F1.4-b	3.3.1-02	E
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Outdoor Air (External)	Loss of Material due to General Corrosion	Preventive Maintenance			G
				Loss of Material due to General Corrosion	Systems Monitoring			G
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Non-Carbon Steel Components (External Surfaces)	M-1	Aluminum Alloys	Indoor Air (External)	None	None			J, 201
		Carbon Steel - Galvanized	Indoor Air (External)	None	None			J, 201
		Copper Alloys	Dry Air/Gas (External)	None	None			J, 201
			Indoor Air (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Preventive Maintenance			J, 207

TABLE 3.2.2-8 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC CONTROL BUILDING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Carbon Steel Components (External Surfaces) (continued)	M-1	Elastomers	Indoor Air (External)	Cracking due to Various Degradation Mechanisms Loss of Material due to Wear	Systems Monitoring			J
		Glass	Indoor Air (External)	None	None			J, 201
		Plastics / Polymers	Indoor Air (External)	Cracking due to Various Degradation Mechanisms	Systems Monitoring			J
		Stainless Steel	Indoor Air (External)	None	None			J, 201
	M-4	Carbon Steel - Galvanized	Indoor Air (External)	None	None			J, 201
		Copper Alloys	Indoor Air (External)	None	None			J, 201
	M-5	Copper Alloys	Indoor Air (External)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Preventive Maintenance			J, 207
			Outdoor Air (External)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Preventive Maintenance			J, 207
	M-6	Insulation	Indoor Air (External)	None	None			J, 201

TABLE 3.2.2-8 (continued) ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC CONTROL BUILDING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Carbon Steel Components (External Surfaces) (Heat Exchanger)	M-5	Aluminum Alloys	Indoor Air (External)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Preventive Maintenance			J, 207
			Outdoor Air (External)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Preventive Maintenance			J, 207

TABLE 3.2.2-9 ENGINEERED SAFETY FEATURES – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR PROTECTION SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Engineered Safety Features (Misc. Non-GALL Components (Inside))	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 201
			Indoor Air (Internal)	None	None			J, 201

Notes for Tables 3.2.2-1 through 3.2.2-9:

Generic Notes:

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 for material, environment, and aging effect, but a different AMP is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG 1801 for this component, material, and environment combination.

I. Aging effect in NUREG-1801 for this component, material, and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific Notes:

201. The BSEP AMR methodology concluded that the subject material in an Indoor Air environment, and in the absence of moisture, has no aging effects.
202. The BSEP methodology concluded that glass components in an Indoor Air environment have no aging effects.
203. Potential for fouling associated with failed coatings is managed by the Protective Coating Monitoring and Maintenance Program.
204. The BSEP AMR methodology concluded that the subject non-metallic material in an Indoor Air environment has no aging effects.
205. The One-Time Inspection Program will include elements to verify the integrity of spatial interaction piping.
206. Internal inspection of the phenolic-lined carbon steel accumulator tanks is performed under the Preventive Maintenance Program.
207. This commodity represents surface of heat exchanger coils.
208. Heat exchangers in this category are in scope for spatial interaction with safety related components. Therefore, only the external surfaces require aging management review.
209. NUREG-1801 identified potential aging effects/mechanisms. The BSEP AMR methodology predicted that pitting corrosion is not applicable due to the lack of sustained wetting and aggressive chemical species required to produce this aging mechanism.
210. NUREG-1801 identified potential aging effects/mechanisms that were not predicted by BSEP AMR methodology. Crevice and pitting corrosion are not applicable due to the lack of sustained wetting and aggressive chemical species required to produce these aging mechanisms. MIC has not been observed in BSEP HVAC environments.
211. NUREG-1801 identified potential aging effects/mechanisms that were not predicted by BSEP AMR methodology. General, crevice, and pitting corrosion are not applicable due to the lack of sustained wetting and aggressive chemical species required to produce these aging mechanisms. MIC has not been observed in BSEP HVAC environments.
212. Short-lived, a PM activity will inspect/replace filter media periodically.
213. NUREG-1801 identified SCC as a potential aging effect. The BSEP methodology does not predict SCC at the temperatures at which components in this group operate.
214. Commodity identifies compressed air/gas components used for pneumatic controls. The BSEP design includes air dryers to ensure that moisture does not cause general and pitting corrosion for the components in this item (Ref. Gall VII.D). The BSEP AMR methodology predicts no aging effects for the subject material in a dry air/gas environment.
215. The BSEP methodology predicts no aging effects for stainless steel in an Indoor Air environment.
216. Commodity identifies a non-corrosive refrigerant portion of the HVAC system. The BSEP AMR methodology predicts no aging effects.
217. The BSEP AMR methodology predicts no aging effects for the subject material and environment. Crevice and pitting corrosion are not applicable due to the lack of sustained wetting and aggressive chemical species required to produce these aging mechanisms.
218. Erosion has been identified as a potential aging mechanism in specific ECCS valves and is to be addressed by one time inspections of these valves and adjacent piping.
219. These components operate at temperatures substantially above ambient, such that moisture-related external corrosion is not expected.
220. The BSEP AMR methodology predicts no aging effects for the subject material in a lube oil environment without moisture intrusion.

221. The BSEP AMR methodology predicts no aging effects at ambient temperatures in a dry air/gas environment.
222. The BSEP AMR methodology predicts no aging effects for glass in a treated water environment.
223. The BSEP AMR methodology predicts no aging effects for copper alloys in an Indoor Air environment without the presence of sustained wetting.
224. The ECCS strainers have a carbon steel base with a stainless steel strainer element. The commodity is treated as carbon steel with a potential for galvanic corrosion for aging management review.
225. The HPCI mini-flow bypass valves have cage trim with smaller openings than the Torus Strainers. Potential for fouling of these cages will be managed by periodic flow verification under the Preventive Maintenance Program.
226. BSEP requested and received approval to implement Risk-Informed ISI. In support of the submittal, evaluations of degradation mechanisms were performed; and cracking due to thermal and mechanical loadings was evaluated and dispositioned as not applicable. The risk associated with cracking due to SCC is bounded by those components selected for inservice inspection as part of the Risk-Informed ISI Program. Therefore, the current inspection methods as detailed in the ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD Program, supplemented by the Water Chemistry Program, will manage cracking of small bore piping.
227. Aging effects are conservatively assumed for the bladder in the hydraulic accumulator. The integrity of this bladder is regularly monitored through the Preventive Maintenance Program.
228. Thermal insulation is credited in room cooler evaluations. Applicable insulation classes are glass fiber or calcium silicate, depending on temperature. No aging effects are predicted for these materials in an indoor environment.
229. Suppression Pool spray is not required for design basis events. Drywell spray nozzles/piping is required but is normally isolated and not subject to plugging or fouling.
230. Instrument piping in this line item is not addressed by the BWR Stress Corrosion Cracking Program due to its size (less than 4 inch).

3.3 AGING MANAGEMENT OF AUXILIARY SYSTEMS

3.3.1 INTRODUCTION

Section 3.3 provides the results of the aging management reviews (AMRs) for those components identified in Subsection 2.3.3, Auxiliary Systems, subject to aging management review. The systems or portions of systems are described in the indicated subsections.

1. Reactor Water Cleanup (RWCU) System (Subsection 2.3.3.1)
2. Reactor Core Isolation Cooling (RCIC) System (Subsection 2.3.3.2)
3. Reactor Building Sampling (RXS) System (Subsection 2.3.3.3)
4. Post Accident Sampling System (PASS) (Subsection 2.3.3.4)
5. Circulating Water (CW) System (As discussed in Subsection 2.3.3.5, this system contains no mechanical components/commodities requiring aging management review.)
6. Screen Wash Water (SCW) System (Subsection 2.3.3.6)
7. Service Water (SW) System (Subsection 2.3.3.7)
8. Reactor Building Closed Cooling Water (RBCCW) System (Subsection 2.3.3.8)
9. Turbine Building Closed Cooling Water (TBCCW) System (As discussed in Subsection 2.3.3.9, this system contains no mechanical components/ commodities requiring aging management review.)
10. Diesel Generator (DG) System (Subsection 2.3.3.10)
11. Heat Tracing System (Subsection 2.3.3.11)
12. Instrument Air (IA) System (Subsection 2.3.3.12)
13. Service Air (SA) System (As discussed in Subsection 2.3.3.13, this system contains no mechanical components/commodities requiring aging management review.)
14. Pneumatic Nitrogen System (PNS) (Subsection 2.3.3.14)
15. Fire Protection (FP) System (Subsection 2.3.3.15)

16. Fuel Oil (FO) System (Subsection 2.3.3.16)

17. Radioactive Floor Drains System (Subsection 2.3.3.17)

18. Radioactive Equipment Drains System (Subsection 2.3.3.18)

19. Makeup Water Treatment System (MWTS) (Subsection 2.3.3.19)

20. Chlorination System (As discussed in Subsection 2.3.3.20, this system contains no mechanical components/commodities requiring aging management review.)

21. Potable Water System (Subsection 2.3.3.21)

22. Process Radiation Monitoring (PRM) System (Subsection 2.3.3.22)

23. Area Radiation Monitoring (ARM) System (As discussed in Subsection 2.3.3.23, this system contains no mechanical components/commodities requiring aging management review.)

24. Liquid Waste Processing System (Subsection 2.3.3.24)

25. Spent Fuel System (As discussed in Subsection 2.3.3.25, this system contains no mechanical components/commodities requiring aging management review.)

26. Fuel Pool Cooling and Cleanup System (Subsection 2.3.3.26)

27. HVAC Diesel Generator Building (Subsection 2.3.3.27)

28. HVAC Reactor Building (Subsection 2.3.3.28)

29. HVAC Service Water Intake Structure (As discussed in Subsection 2.3.3.29, this system contains no mechanical components/commodities requiring aging management review.)

30. HVAC Turbine Building (As discussed in Subsection 2.3.3.30, this system contains no mechanical components/commodities requiring aging management review.)

31. HVAC Radwaste Building (As discussed in Subsection 2.3.3.31, this system contains no mechanical components/commodities requiring aging management review.)

32. Torus Drain System (Subsection 2.3.3.32)

33. Civil Structure Auxiliary Systems (Subsection 2.3.3.33)

34. Non-Contaminated Water Drainage System (NCWDS) (Subsection 2.3.3.34)

Table 3.3.1, Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component/commodity groups in this Section. Table 3.3.1 uses the format of Table 1 described in Section 3.0 above.

3.3.1.1 Operating Experience

The AMR methodology applied at BSEP included use of operating experience (OE) to confirm the set of aging effects that had been predicted through material/environment evaluations. Plant-specific and industry OE through March 18, 2003 was identified and reviewed. OE subsequent to that date will be reviewed and applicable OE will be updated, as required, in conjunction with the amendment to the application required by 10 CFR 54.21(b). The OE review consisted of the following:

Site: BSEP site-specific OE has been captured by a review of the Action Tracking and the Maintenance Rule databases. This effort included a review of work management and leak log records, applicable correspondence (Licensee Event Reports, etc.), and Nuclear Assessment Section assessment records. The plant-specific OE review identified the following additional aging effects: loss of material due to flow-accelerated corrosion (FAC) of certain components in the Reactor Water Cleanup System, FAC of drain pots and downstream components of the Reactor Core Isolation Cooling System, and erosion and galvanic corrosion of piping and valves in the Screen Wash Water and Service Water Systems.

Industry: Industry OE has been captured in NUREG-1801, "Generic Aging Lessons Learned (GALL)," and is the primary method for verifying that a complete set of potential aging effects is identified. An evaluation of industry OE published since the effective date of NUREG-1801 was performed to identify any additional aging effects requiring management. This was performed using Progress Energy internal OE review process which directs the review of OE and requires that it be screened and evaluated for site applicability. OE sources subject to review under this procedure include INPO and WANO items, NRC documents (Information Notices, Generic Letters, Notices of Violation, and staff reports), 10 CFR 21 reports, and vendor bulletins, as well as corporate internal OE information from Progress Energy nuclear sites. The industry OE review identified no additional unpredicted aging effects requiring management.

On-Going On-going review of plant-specific and industry operating experience is continuing to be performed in accordance with the Corrective Action Program and the Progress Energy internal OE review process.

3.3.2 RESULTS

The following tables summarize the results of the aging management review for systems in the Auxiliary Systems area.

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Radioactive Floor Drains System

Table 3.3.2-15 Auxiliary Systems – Summary of Aging Management Evaluation – Radioactive Equipment Drains System

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation – Makeup Water Treatment System (MWTS)

Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation – Potable Water System (PWS)

Table 3.3.2-18 Auxiliary Systems – Summary of Aging Management Evaluation – Process Radiation Monitoring (PRM) System

Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Waste Processing System

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Pool Cooling and Cleanup System

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation – HVAC Diesel Generator Building

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – HVAC Reactor Building

Table 3.3.2-23 Auxiliary Systems – Summary of Aging Management Evaluation – Torus Drain System

Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Civil Structure Auxiliary Systems

Table 3.3.2-25 Auxiliary Systems – Summary of Aging Management Evaluation – Non-Contaminated Water Drainage System (NCWDS).

These tables use the format of Table 2 described in Section 3.0 above.

3.3.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The materials from which specific components/commodities are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following subsections.

3.3.2.1.1 Reactor Water Cleanup (RWCU) System

Materials

The materials of construction for the RWCU System components are:

- Carbon Steel
- Glass
- Stainless Steel

Environment

The RWCU System components are exposed to the following:

- Indoor Air
- Treated Water
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following RWCU System aging effects require management:

- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the RWCU System components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- BWR Stress Corrosion Cracking Program
- Flow-Accelerated Corrosion Program
- One-Time Inspection Program
- Systems Monitoring Program
- Water Chemistry Program

3.3.2.1.2 Reactor Core Isolation Cooling (RCIC) System

Materials

The materials of construction for the RCIC System components are:

- Carbon Steel
- Copper Alloys
- Glass
- Grey Cast Iron

- Insulation
- Stainless Steel

Environment

The RCIC System components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Lube Oil
- Treated Water
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following RCIC System aging effects require management:

- Cracking
- Flow Blockage
- Loss of Heat Transfer Effectiveness
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the RCIC System components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- BWR Stress Corrosion Cracking Program
- Flow-Accelerated Corrosion Program
- One-Time Inspection Program
- Protective Coating Monitoring and Maintenance Program
- Selective Leaching of Materials Program
- Systems Monitoring Program
- Water Chemistry Program

3.3.2.1.3 Reactor Building Sampling (RXS) System

Materials

The materials of construction for the RXS System components are:

- Copper Alloys
- Stainless Steel

Environment

The RXS System components are exposed to the following:

- Indoor Air
- Treated Water
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following RXS System aging effects require management:

- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the RXS System components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- One-Time Inspection Program
- Water Chemistry Program

3.3.2.1.4 Post Accident Sampling System (PASS)

Materials

The materials of construction for the PASS components are:

- Copper Alloys
- Stainless Steel

Environment

The PASS components are exposed to the following:

- Indoor Air
- Treated Water

Aging Effects Requiring Management

The following PASS aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the PASS components:

- Closed-Cycle Cooling Water System Program
- One-Time Inspection Program
- Selective Leaching of Materials Program
- Water Chemistry Program

3.3.2.1.5 Screen Wash Water (SCW) System

Materials

The materials of construction for the SCW System components are:

- Carbon Steel
- Copper Alloys
- Plastics/Polymers
- Stainless Steel

Environment

The SCW System components are exposed to the following:

- Indoor Air
- Raw Water

Aging Effects Requiring Management

The following SCW System aging effects require management:

- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the SCW System components:

- One-Time Inspection Program
- Selective Leaching of Materials Program
- Systems Monitoring Program

3.3.2.1.6 Service Water (SW) System

Materials

The materials of construction for the SW System components are:

- Carbon Steel
- Copper Alloys
- Plastics/Polymers
- Stainless Steel

Environment

The SW System components are exposed to the following:

- Buried
- Indoor Air
- Lube Oil
- Raw Water

Aging Effects Requiring Management

The following SW System aging effects require management:

- Cracking
- Flow Blockage
- Loss of Heat Transfer Effectiveness
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the SW System components:

- Buried Piping and Tanks Inspection Program
- Open-Cycle Cooling Water System Program
- Selective Leaching of Materials Program
- Systems Monitoring Program

3.3.2.1.7 Reactor Building Closed Cooling Water (RBCCW) System

Materials

The materials of construction for the RBCCW System components are:

- Carbon Steel
- Copper Alloys
- Glass
- Stainless Steel

Environment

The RBCCW System components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Treated Water

Aging Effects Requiring Management

The following RBCCW System aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the RBCCW System components:

- Closed-Cycle Cooling Water System Program
- Preventive Maintenance Program
- Systems Monitoring Program

3.3.2.1.8 Diesel Generator (DG) System (including Auxiliaries)

Materials

The materials of construction for the DG System components are:

- Carbon Steel
- Copper Alloys
- Filter Media
- Glass
- Grey Cast Iron
- Stainless Steel
- Strainer Element

Environment

The DG System components are exposed to the following:

- Buried
- Diesel Exhaust Gas
- Dry Air/Gas
- Fuel Oil
- Indoor Air
- Lube Oil
- Outdoor Air

- Raw Water
- Treated Water

Aging Effects Requiring Management

The following DG System aging effects require management:
- Change in Material Properties
- Cracking
- Flow Blockage
- Loss of Heat Transfer Effectiveness
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the DG System components:
- Buried Piping and Tanks Inspection Program
- Closed-Cycle Cooling Water System Program
- Fuel Oil Chemistry Program
- One-Time Inspection Program
- Open-Cycle Cooling Water system Program
- Preventive Maintenance Program
- Selective Leaching of Materials Program
- Systems Monitoring Program

3.3.2.1.9 Heat Tracing System

Materials

The materials of construction for the Heat Tracing System components are:
- Carbon Steel

Environment

The Heat Tracing System components are exposed to the following:
- Indoor Air
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following Heat Tracing System aging effects require management:
- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the Heat Tracing System components:

- One-Time Inspection Program
- Systems Monitoring Program

3.3.2.1.10 Instrument Air (IA) System

Materials

The materials of construction for the IA System components are:

- Aluminum Alloys
- Carbon Steel
- Carbon Steel – Galvanized
- Copper Alloys
- Stainless Steel

Environment

The IA System components are exposed to the following:

- Dry Air/Gas
- Indoor Air

Aging Effects Requiring Management

The following IA System aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the IA System components:

- One-Time Inspection Program
- Systems Monitoring Program

3.3.2.1.11 Pneumatic Nitrogen System (PNS)

Materials

The materials of construction for the PNS components are:

- Aluminum Alloys
- Stainless Steel

Environment

The PNS components are exposed to the following:

- Dry Air/Gas
- Indoor Air

Aging Effects Requiring Management

The following PNS aging effects require management:

- None

Aging Management Programs

The following AMPs manage the aging effects for the PNS components:

- None

3.3.2.1.12 Fire Protection (FP) System

Materials

The materials of construction for the FP System components are:

- Aluminum Alloys
- Carbon Steel
- Carbon Steel – Galvanized
- Copper Alloys
- Glass
- Grey Cast Iron
- Stainless Steel

Environment

The FP System components are exposed to the following:

- Buried
- Dry Air/Gas
- Indoor Air
- Outdoor Air
- Raw Water
- Treated Water

Aging Effects Requiring Management

The following FP System aging effects require management:

- Cracking
- Loss of Heat Transfer Effectiveness
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the FP System components:

- Aboveground Carbon Steel Tanks Program
- Buried Piping and Tanks Inspection Program
- Fire Protection Program
- Fire Water System Program
- Selective Leaching of Materials Program
- Systems Monitoring Program

3.3.2.1.13 Fuel Oil (FO) System

Materials

The materials of construction for the FO System components are:

- Carbon Steel
- Copper Alloys

Environment

The FO System components are exposed to the following:

- Buried
- Fuel Oil
- Indoor Air
- Outdoor Air

Aging Effects Requiring Management

The following FO System aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the FO System components:

- Aboveground Carbon Steel Tanks Program
- Buried Piping and Tanks Inspection Program

- Fire Protection Program
- Fuel Oil Chemistry Program
- One-Time Inspection Program
- Systems Monitoring Program

3.3.2.1.14 Radioactive Floor Drains System

Materials

The materials of construction for the Radioactive Floor Drains System components are:

- Carbon Steel
- Copper Alloys
- Grey Cast Iron
- Stainless Steel

Environment

The Radioactive Floor Drains System components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Raw Water

Aging Effects Requiring Management

The following Radioactive Floor Drains System aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the Radioactive Floor Drains System components:

- One-Time Inspection Program
- Selective Leaching of Materials Program
- Systems Monitoring Program

3.3.2.1.15 Radioactive Equipment Drains System

Materials

The materials of construction for the Radioactive Equipment Drains System components are:

- Carbon Steel

- Copper Alloys
- Stainless Steel

Environment

The Radioactive Equipment Drains System components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Treated Water

Aging Effects Requiring Management

The following Radioactive Equipment Drains System aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the Radioactive Equipment Drains System components:

- One-Time Inspection Program
- Systems Monitoring Program
- Water Chemistry Program

3.3.2.1.16 Makeup Water Treatment System (MWTS)

Materials

The materials of construction for the MWTS components are:

- Aluminum Alloys
- Carbon Steel
- Grey Cast Iron
- Stainless Steel

Environment

The MWTS components are exposed to the following:

- Indoor Air
- Outdoor Air
- Raw Water
- Treated Water

Aging Effects Requiring Management

The following MWTS aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the MWTS components:

- One-Time Inspection Program
- Selective Leaching of Materials Program
- Systems Monitoring Program
- Water Chemistry Program

3.3.2.1.17 Potable Water System (PWS)

Materials

The materials of construction for the PWS components are:

- Copper Alloys

Environment

The PWS components are exposed to the following:

- Indoor Air
- Raw Water

Aging Effects Requiring Management

The following PWS aging effects require management:

- Loss of Material

Aging Management Programs

The following AMP manages the aging effects for the PWS components:

- One-Time Inspection Program

3.3.2.1.18 Process Radiation Monitoring (PRM) System

Materials

The materials of construction for the PRM System components are:

- Carbon Steel

Environment

The PRM System components are exposed to the following:
- Indoor Air
- Treated Water

Aging Effects Requiring Management

The following PRM System aging effects require management:
- Loss of Material

Aging Management Programs

The following AMP manages the aging effects for the PRM System components:
- Closed-Cycle Cooling Water System Program

3.3.2.1.19 Liquid Waste Processing System

Materials

The materials of construction for the Liquid Waste Processing System components are:
- Carbon Steel
- Stainless Steel

Environment

The Liquid Waste Processing System components are exposed to the following:
- Dry Air/Gas
- Indoor Air
- Treated Water

Aging Effects Requiring Management

The following Liquid Waste Processing System aging effects require management:
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the Liquid Waste Processing System components:

- One-Time Inspection Program
- Systems Monitoring Program
- Water Chemistry Program

3.3.2.1.20 Fuel Pool Cooling and Cleanup System

Materials

The materials of construction for the Fuel Pool Cooling and Cleanup System components are:

- Carbon Steel
- Glass
- Stainless Steel

Environment

The Fuel Pool Cooling and Cleanup System components are exposed to the following:

- Indoor Air
- Treated Water

Aging Effects Requiring Management

The following Fuel Pool Cooling and Cleanup System aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the Fuel Pool Cooling and Cleanup System components:

- Closed-Cycle Cooling Water System Program
- One-Time Inspection Program
- Systems Monitoring Program
- Water Chemistry Program

3.3.2.1.21 HVAC Diesel Generator Building

Materials

The materials of construction for the HVAC Diesel Generator Building components are:

- Aluminum Alloys
- Carbon Steel
- Carbon Steel – Galvanized
- Copper Alloys
- Elastomers
- Plastics/Polymers
- Stainless Steel

Environment

The HVAC Diesel Generator Building components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Outdoor Air

Aging Effects Requiring Management

The following HVAC Diesel Generator Building aging effects require management:

- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the HVAC Diesel Generator Building components:

- Preventive Maintenance Program
- Systems Monitoring Program

3.3.2.1.22 HVAC Reactor Building

Materials

The materials of construction for the HVAC Reactor Building components are:

- Aluminum Alloys
- Carbon Steel
- Carbon Steel – Galvanized
- Copper Alloys
- Elastomers

- Plastics/Polymers
- Stainless Steel

Environment

The HVAC Reactor Building components are exposed to the following:

- Dry Air/Gas
- Indoor Air
- Outdoor Air
- Raw Water

Aging Effects Requiring Management

The following HVAC Reactor Building aging effects require management:

- Cracking
- Loss of Heat Transfer Effectiveness
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the HVAC Reactor Building components:

- Open-Cycle Cooling Water System Program
- Preventive Maintenance Program
- Systems Monitoring Program

3.3.2.1.23 Torus Drain System

Materials

The materials of construction for the Torus Drain System components are:

- Carbon Steel
- Stainless Steel

Environment

The Torus Drain System components are exposed to the following:

- Indoor Air
- Treated Water

Aging Effects Requiring Management

The following Torus Drain System aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the Torus Drain System components:

- One-time Inspection Program
- Systems Monitoring Program
- Water Chemistry Program

3.3.2.1.24 Civil Structure Auxiliary Systems

Materials

The materials of construction for the Civil Structure Auxiliary System components are:

- Carbon Steel
- Copper Alloys
- Glass
- Grey Cast Iron
- Plastics/Polymers
- Stainless Steel

Environment

The Civil Structure Auxiliary System components are exposed to the following:

- Indoor Air
- Raw Water

Aging Effects Requiring Management

The following Civil Structure Auxiliary System aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the Civil Structure Auxiliary System components:

- Preventive Maintenance Program
- Selective Leaching of Materials Program

3.3.2.1.25 Non-Contaminated Water Drainage System (NCWDS)

Materials

The materials of construction for the NCWDS components are:
- Carbon Steel

Environment

The NCWDS components are exposed to the following:
- Indoor Air
- Raw Water

Aging Effects Requiring Management

The following NCWDS aging effects require management:
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the NCWDS components:
- One-Time Inspection Program
- Systems Monitoring Program

3.3.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the LRA. For the Auxiliary Systems, those programs are addressed in the following subsections.

3.3.2.2.1 Loss of Material Due to General, Pitting, and Crevice Corrosion

3.3.2.2.1.1 Spent Fuel Pool Cooling Heat Exchangers

This paragraph discusses aging effects/mechanisms that could occur on various heat exchanger components of the Fuel Pool Cooling System exposed to the treated water used as coolant for the fuel pools. This section specifically discusses verification of the effectiveness of the Water Chemistry Program for the management of these aging effects/mechanisms for the piping, valves, heat exchanger components and pump casings. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program for the management of corrosion for the surfaces of components normally exposed to the fuel pool treated water.

3.3.2.2.1.2 Spent Fuel Pool Cooling Piping, Valves, Filters, and Ion Exchangers

This paragraph discusses aging effects/mechanisms that could occur on various components of the Fuel Pool Cooling System exposed to the treated water used as coolant for the fuel pools. This section specifically discusses verification of the effectiveness of the Water Chemistry Program for the management of these aging effects/mechanisms for the piping, valves, heat exchanger components and pump casings. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program for the management of corrosion for the surfaces of components normally exposed to the fuel pool treated water.

3.3.2.2.2 Hardening and Cracking or Loss of Strength Due to Elastomer Degradation or Loss of Material Due to Wear

This paragraph discusses aging effects/mechanisms that could occur on elastomer components exposed to air and a range of atmospheric conditions. The plant-specific Systems Monitoring Program will manage aging effects/mechanisms for the subject external surfaces. The plant-specific Preventive Maintenance Program will manage aging effects/mechanisms for the subject internal surfaces for Emergency Diesel Generator Building, Reactor Building, and Control Building ventilation systems. No valve elastomers requiring aging management have been identified in the Fuel Pool Cooling System.

3.3.2.2.3 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). Fatigue in the Reactor Water Cleanup System is discussed in LRA Section 4.3. Fatigue of cranes/load handling systems that fall within the scope of 10 CFR 54.21(c) are addressed in LRA Subsection 4.7.3. BSEP is not an older BWR with a shutdown cooling system.

3.3.2.2.4 Crack Initiation and Growth Due to Cracking or Stress Corrosion Cracking

This paragraph discusses cracking due to SCC for the Reactor Water Cleanup System heat exchangers. This paragraph is not applicable to BSEP because only the carbon steel shells of Reactor Water Cleanup System heat exchangers have an intended function. Carbon steel is typically not subject to SCC.

3.3.2.2.5 Loss of Material Due to General, Microbiologically Influenced, Pitting, and Crevice Corrosion

This subsection discusses loss of material from corrosion that could occur on component surfaces exposed to air under a range of atmospheric conditions.

In general, aging of carbon steel exterior surfaces exposed to moist air will be managed for loss of material using the Systems Monitoring Program for those components with operating temperatures less than 212°F. The One-Time Inspection Program will confirm that aging is managed on the interior surfaces of those components exposed to moist air not subject to periodic inspection under the Preventive Maintenance Program. The following is a discussion of system-specific practices.

Components described by this paragraph requiring aging management for loss of material are carbon steel with the exception of a drain valve in the Control Building HVAC System. The potential for loss of material due to crevice corrosion and pitting corrosion exists for the internal surface of a stainless steel valve located in the condensate drain piping of the HVAC Control Building System. The internal surface of this valve is normally in a moist air environment and is subject to periodic wetting. The condition of the valve will be confirmed by the One-Time Inspection Program as shown on Table 3.2.2-8 for the HVAC Control Building System commodity group for Piping (Piping and Fittings).

The external surfaces of the plate coils within the Penetration Cooling System are normally concealed from view, such that routine visual inspection is not practical. These components will be managed with the Preventive Maintenance Program.

Aging of both the exterior and interior surfaces of miscellaneous mechanical components associated with the Control Building, Diesel Generator Building, Service Water Intake Structure, and Reactor Buildings will be managed for loss of material using the Preventive Maintenance Program. These include sump pump components and back flow valves.

Aging of exterior surfaces of above ground carbon steel tanks associated with the Fire Protection System will be managed by the Aboveground Carbon Steel Tanks Program.

3.3.2.2.6 Loss of Material Due to General, Galvanic, Pitting, and Crevice Corrosion

As indicated in NUREG-1800, this Subsection is applicable to reactor coolant pump oil collection systems. BSEP is not designed with a reactor coolant pump oil collection system, because the reactor coolant pumps are contained within the primary containment which is inerted with nitrogen during normal operation.

3.3.2.2.7 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion, and Biofouling

This subsection discusses loss of material of the internal surface of fuel oil tanks in the diesel fuel oil system and on diesel engines of the emergency diesel generators. The Fuel Oil Chemistry Program, which includes exceptions to NUREG-1801, manages loss of material and fouling for all components wetted by fuel oil. This also includes the tank and other components supplying fuel to the diesel fire pump. The effectiveness of the Fuel Oil Chemistry Program is confirmed by inspection of fuel oil tanks using the One-Time Inspection Program.

3.3.2.2.8 Quality Assurance for Aging Management of Non-Safety Related Components

QA provisions applicable to LR are discussed in Appendix B, Section B.1.3.

3.3.2.2.9 Crack Initiation and Growth Due to Stress Corrosion Cracking and Cyclic Loading

This discussion is applicable to PWR systems only.

3.3.2.2.10 Reduction of Neutron Absorbing Capacity and Loss of Material Due to General Corrosion

The BSEP boral plates are sandwiched between the inner and outer wall of the rack tubes and are not subject to dislocation, deterioration, or removal. Plant-specific operating experience and testing results of BSEP boral sample stations have validated the absence of aging effects. Therefore, no aging management program is required for this commodity.

3.3.2.2.11 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

This subsection discusses the potential for loss of material of underground piping and fittings of the Service Water and Diesel Fuel Oil Systems. The AMP used at BSEP is the Buried Piping and Tanks Inspection Program. The program relies on industry practice and operating experience to manage the effects of loss of material from exterior corrosion. Application of this program at BSEP is consistent with NUREG-1801 with program exceptions.

3.3.2.3 Time-Limited Aging Analysis

The Time-Limited Aging Analyses (TLAA) identified below are associated with the Auxiliary Systems components. The subsection of the application that contains the TLAA review results is indicated in parenthesis.

1. Fatigue (Section 4.3, Metal Fatigue and Subsection 4.7.3, Crane, Refueling Platform, and Monorail Hoist Cyclic Load Limits)

3.3.3 CONCLUSIONS

The Auxiliary Systems components/commodities having aging effects requiring management have been evaluated, and aging management programs have been selected to manage the aging effects. A description of the aging management programs is provided in Appendix B, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging will be adequately managed so that there is reasonable assurance that the intended functions of Auxiliary Systems components/commodities will be maintained consistent with the current licensing basis during the period of extended operation.

TABLE 3.3.1 SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VII OF NUREG-1801 FOR AUXILIARY SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-01	Components in spent fuel pool cooling and cleanup	Loss of material due to general, pitting, and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	Consistent with NUREG-1801, with exceptions. Aging effects are managed by the combination of the Water Chemistry and One-Time Inspection Programs. The exceptions involve differences from the NUREG-1801 recommendations for both of these programs. Further evaluation is documented in Subsections 3.3.2.2.1.1 and 3.3.2.2.1.2.
3.3.1-02	Linings in spent fuel pool cooling and cleanup system; seals and collars in ventilation systems	Hardening, cracking and loss of strength due to elastomer degradation; loss of material due to wear	Plant specific	Yes, plant specific	The plant-specific AMPs used to manage the aging effects are the Preventive Maintenance Program and the Systems Monitoring Program. Further evaluation is documented in Subsection 3.3.2.2.2.
3.3.1-03	Components in load handling, chemical and volume control system (PWR), and reactor water cleanup and shutdown cooling systems (older BWR)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA; further evaluation is documented in Subsection 3.3.2.2.3.

TABLE 3.3.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VII OF NUREG-1801 FOR AUXILIARY SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-04	Heat exchangers in reactor water cleanup system (BWR); high pressure pumps in chemical and volume control system (PWR)	Crack initiation and growth due to SCC or cracking	Plant specific	Yes, plant specific	Not applicable. Further evaluation is documented in Subsection 3.3.2.2.4.
3.3.1-05	Components in ventilation systems, diesel fuel oil system, and emergency diesel generator systems; external surfaces of carbon steel components	Loss of material due to general, pitting, and crevice corrosion, and MIC	Plant specific	Yes, plant specific	Plant-specific AMPs are used to manage the loss of material for in-scope components due to corrosion that could occur on surfaces exposed to air under a range of atmospheric conditions. In general, aging of exterior surfaces exposed to moist air will be managed for loss of material using the plant-specific Systems Monitoring Program. In addition, the One-Time Inspection Program will apply to the interior surfaces of those components not subject to the plant-specific Preventive Maintenance Program. System specific information is provided in the further evaluation discussion in Subsection 3.3.2.2.5.
3.3.1-06	Components in reactor coolant pump oil collect system of fire protection	Loss of material due to galvanic, general, pitting, and crevice corrosion	One-time inspection	Yes, detection of aging effects is to be further evaluated	This item is not applicable as discussed in Subsection 3.3.2.2.6.

TABLE 3.3.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VII OF NUREG-1801 FOR AUXILIARY SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-07	Diesel fuel oil tanks in diesel fuel oil system and emergency diesel generator system	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling	Fuel oil chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	Consistent with NUREG-1801, with exceptions. Both the Fuel Oil Chemistry Program and the One-Time Inspection Program are credited. The exceptions apply to the NUREG-1801 recommendations for implementation of both programs. Further evaluation is documented in Subsection 3.3.2.2.7.
3.3.1-08	Piping, pump casing, and valve body and bonnets in shutdown cooling system (older BWR)	Loss of material due to pitting and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	This item is not applicable; the BSEP design does not include this system.
3.3.1-09	PWR Only				
3.3.1-10	Neutron absorbing sheets in spent fuel storage racks	Reduction of neutron absorbing capacity and loss of material due to general corrosion (Boral, boron steel)	Plant specific	Yes, plant specific	Not applicable; further evaluation is documented in Subsection 3.3.2.2.10.
3.3.1-11	New fuel rack assembly	Loss of material due to general, pitting, and crevice corrosion	Structures monitoring	No	Not applicable. The new fuel racks are classified as non-seismic and non-safety related; as such, they support no license renewal intended function and do not require aging management.

TABLE 3.3.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VII OF NUREG-1801 FOR AUXILIARY SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-12	Neutron absorbing sheets in spent fuel storage racks	Reduction of neutron absorbing capacity due to Boraflex degradation	Boraflex monitoring	No	Not applicable. The aging effect of concern is a reduction of neutron absorbing capacity due to Boraflex degradation. BSEP uses Boral as the spent fuel storage rack neutron absorber.
3.3.1-13	Spent fuel storage racks and valves in spent fuel pool cooling and cleanup	Crack initiation and growth due to stress corrosion cracking	Water chemistry	No	Not applicable. The aging effect of concern is crack initiation and growth due to stress corrosion cracking (SCC). The Fuel Pool Cooling System utilizes a combination of carbon steel and stainless steel components. BSEP methodology does not predict SCC for carbon steel or for stainless steel in demineralized water operating below 140°F.
3.3.1-14	Closure bolting and external surfaces of carbon steel and low-alloy steel components	Loss of material due to boric acid corrosion	Boric acid corrosion	No	Not applicable. The aging effect of concern is loss of material due to boric acid corrosion. BSEP is a BWR that does not utilize boric acid.
3.3.1-15	Components in or serviced by closed-cycle cooling water system	Loss of material due to general, pitting, and crevice corrosion, and MIC	Closed-cycle cooling water system	No	Consistent with NUREG-1801. The aging effect of loss of material of components operating in a treated water environment in the Reactor Coolant Recirculation, Reactor Building Closed Cooling Water, Diesel Generator, Process Radiation Monitoring, Fuel Pool Cooling, and Penetration Cooling Systems is managed by the means of the Closed-Cycle Cooling Water System Program.

TABLE 3.3.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VII OF NUREG-1801 FOR AUXILIARY SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-16	Cranes including bridge and trolleys and rail system in load handling system	Loss of material due to general corrosion and wear	Overhead heavy load and light load handling systems	No	Consistent with NUREG-1801. The AMP Inspection of Overhead Heavy Load and Light Load Handling Systems Program is used to manage the applicable aging effects. Cranes and other lifting devices are evaluated in Section 3.5.
3.3.1-17	Components in or serviced by open-cycle cooling water systems	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling; buildup of deposit due to biofouling	Open-cycle cooling water system	No	Consistent with NUREG-1801. Loss of material and fouling of components operating in a raw water environment in the Residual Heat Removal, Service Water, Diesel Jacket Water, and Diesel Generator Service Water Systems are managed by the Open-Cycle Cooling Water System Program. Where appropriate, this program is supplemented by the Selective Leaching of Materials Program. Aging of the treated water side of system heat exchanger components is managed with the Closed-Cycle Cooling Water System Program.
3.3.1-18	Buried piping and fittings	Loss of material due to general, pitting, and crevice corrosion, and MIC	Buried piping and tanks surveillance or Buried piping and tanks inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	 Consistent with NUREG-1801 with exceptions. The Buried Piping and Tanks Inspection Program manages loss of material from exterior corrosion for applicable components. Further evaluation of buried piping and tanks is documented in Subsection 3.3.2.2.11.

TABLE 3.3.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VII OF NUREG-1801 FOR AUXILIARY SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-19	Components in compressed air system	Loss of material due to general and pitting corrosion	Compressed air monitoring	No	Different programs apply. BSEP has completed steps, in accordance with Generic Letter 88-14, to periodically test air quality, review trend data, and initiate corrective actions, as appropriate, for the Instrument Air System. Moisture downstream of air dryers is controlled. The One-Time Inspection Program will be used to confirm the absence of the loss of material aging effect, due to general corrosion, for the internal surfaces of carbon steel piping exposed to air of the Instrument Air System where moisture is present.
3.3.1-20	Components (doors and barrier penetra-tion seals) and concrete structures in fire protection	Loss of material due to wear; hardening and shrinkage due to weathering	Fire protection	No	Consistent with NUREG-1801 as amended by NRC Interim Staff Guidance (ISG)-04. Aging effects are managed by the Fire Protection Program.
3.3.1-21	Components in water-based fire protection	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling	Fire water system	No	Consistent with NUREG-1801 as amended by NRC Interim Staff Guidance (ISG)-04. Aging effects are managed by the Fire Water System Program.

TABLE 3.3.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VII OF NUREG-1801 FOR AUXILIARY SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-22	Components in diesel fire system	Loss of material due to galvanic, general, pitting, and crevice corrosion	Fire protection and fuel oil chemistry	No	Consistent with NUREG-1801 with exceptions. The Fuel Oil Chemistry Program manages loss of material and fouling for the fuel supply to the fire pump. The exceptions apply to the NUREG-1801 recommendations for Fuel Oil Chemistry Program implementation. The Fire Protection Program requires that the diesel-driven fire pump be periodically tested to ensure the intended function of the fuel supply line, from the diesel fire pump fuel oil tank to the diesel-driven fire pump engine, can be performed. The fuel supply line is comprised of a single copper alloy isolation valve and short run of tubing from the diesel fire pump fuel oil tank to the diesel-driven fire pump engine. These components are annotated with plant specific note 347.
3.3.1-23	Tanks in diesel fuel oil system	Loss of material due to general, pitting, and crevice corrosion	Aboveground carbon steel tanks	No	Consistent with NUREG-1801. Aging effects of the outdoor/aboveground main fuel oil storage tank are managed by the Aboveground Carbon Steel Tanks Program. Other in-scope diesel fuel storage tanks are located indoors and are subject to the Systems Monitoring Program for the management of loss of material due to external corrosion.

TABLE 3.3.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VII OF NUREG-1801 FOR AUXILIARY SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-24	Closure bolting	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and SCC	Bolting integrity	No	Not applicable. Non-Class 1 closure bolting is considered to be a subcomponent of the associated component. Auxiliary Systems do not use high-strength pressure boundary bolting. Bolting materials were not itemized as a separate component. Therefore, a bolting integrity program is not credited for aging management. The AMP credited for visual identification of external general corrosion (Systems Monitoring Program) will also address bolting materials.
3.3.1-25	Components in contact with sodium penta-borate solution in standby liquid control system (BWR)	Crack initiation and growth due to SCC	Water chemistry	No	Not applicable. NUREG-1801 identifies SCC of stainless steel as an applicable aging effect for components in contact with a sodium pentaborate solution. At BSEP, the only Standby Liquid Control System components that operate hot enough to be susceptible to SCC are portions of Class 1 piping, which are part of the RCPB. The high temperature Standby Liquid Control System components operate in a reactor water environment free of a significant concentration of sodium pentaborate.
3.3.1-26	Components in reactor water cleanup system	Crack initiation and growth due to SCC and IGSCC	Reactor water cleanup system inspection	No	Different programs apply. Two programs are substituted for the suggested NUREG-1801 program to manage crack initiation and growth due to SCC and IGSCC in applicable Reactor Water Cleanup System piping components beyond the second isolation valve. Chemistry requirements are captured in the Water Chemistry Program. NUREG-0313 and Generic Letter 88-01 inspection require-ments are captured, as augmented inspections, in the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program.

TABLE 3.3.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VII OF NUREG-1801 FOR AUXILIARY SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1-27	Components in shutdown cooling system (older BWR)	Crack initiation and growth due to SCC	BWR stress corrosion cracking and water chemistry	No	This item is not applicable; the BSEP design does not include this system.
3.3.1-28	Components in shutdown cooling system (older BWR)	Loss of material due to pitting and crevice corrosion, and MIC	Closed-cycle cooling water system	No	This item is not applicable; the BSEP design does not include this system.
3.3.1-29	Components (aluminum bronze, brass, cast iron, cast steel) in open-cycle and closed-cycle cooling water systems, and ultimate heat sink	Loss of material due to selective leaching	Selective leaching of materials	No	Consistent with NUREG-1801 with exceptions. Loss of material due to selective leaching is managed for susceptible components using the Selective Leaching of Materials Program.
3.3.1-30	Fire barriers, walls, ceilings, and floors in fire protection	Concrete cracking and spalling due to freeze-thaw, aggressive chemical attack, and reaction with aggregates; loss of material due to corrosion of embedded steel	Fire protection and structures monitoring	No	Consistent with NUREG-1801. Aging effects are managed by the Fire Protection Program as amended by NRC Interim Staff Guidance (ISG)-04 and the Structures Monitoring Program.

TABLE 3.3.2-1 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR WATER CLEANUP (RWCU) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Lines to Reactor Water Cleanup (RWC) and Standby Liquid Control (SLC) Systems)	M-1	Carbon Steel	Indoor Air (External)	None	None			G, 326
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			F
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.1-a	3.1.1-25	D
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
		Stainless Steel	Indoor Air (External)	None	None			G, 325
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 314
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.1-f	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	

TABLE 3.3.2-1 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR WATER CLEANUP (RWCU) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1	Carbon Steel	Indoor Air (External)	None	None			G, 326
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.1-a	3.1.1-25	D
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 348

TABLE 3.3.2-1 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR WATER CLEANUP (RWCU) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Small Bore Piping Less than NPS 4) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			G, 325
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 314
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to SCC	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	E, 348
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 348

TABLE 3.3.2-1 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR WATER CLEANUP (RWCU) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body)	M-1	Carbon Steel	Indoor Air (External)	None	None			G, 326
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	
		Stainless Steel	Indoor Air (External)	None	None			G, 325
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H, 314
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.3-c	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	

TABLE 3.3.2-1 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR WATER CLEANUP (RWCU) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings (Beyond Second Isolation Valves))	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VII.E3.1-b	3.3.1-03	
		Stainless Steel	Indoor Air (External)	None	None			G, 325
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H, 314
				Cracking due to SCC	Section XI Inservice Inspection and Water Chemistry	VII.E3.1-a	3.3.1-26	E, 328
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VII.E3.1-b	3.3.1-03	
	M-4	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VII.E3.1-b	3.3.1-03	

TABLE 3.3.2-1 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR WATER CLEANUP (RWCU) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Regenerative Heat Exchanger (Shell and Access Cover)	M-4	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VII.E3.1-b	3.3.1-03	
Reactor Water Cleanup System (BWR) (Valves (Beyond Second Isolation Valves))	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VII.E3.1-b	3.3.1-03	
		Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VII.E3.1-b	3.3.1-03	

TABLE 3.3.2-1 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR WATER CLEANUP (RWCU) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Reactor Water Cleanup System (BWR) (Valves (Beyond Second Isolation Valves)) (continued)	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VII.E3.1-b	3.3.1-03	
Reactor Water Cleanup System (BWR) (Tanks, Pumps, and Piping Specialties (Beyond Second Isolation Valves))	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Glass	Indoor Air (External)	None	None			J, 319
			Treated Water (Internal)	None	None			J, 329
		Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VII.E3.1-b	3.3.1-03	

TABLE 3.3.2-1 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR WATER CLEANUP (RWCU) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Reactor Water Cleanup System (BWR) (Tanks, Pumps, and Piping Specialties (Beyond Second Isolation Valves)) (continued)	M-3	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VII.E3.1-b	3.3.1-03	
	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VII.E3.1-b	3.3.1-03	
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E

TABLE 3.3.2-2 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Reactor Core Isolation Cooling (RCIC) System)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 331
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.1-a	3.1.1-25	D
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-e	3.1.1-01	
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-e	3.1.1-01	
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.1-f	3.1.1-29	D

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Reactor Core Isolation Cooling (RCIC) System) (continued)	M-3	Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-e	3.1.1-01	
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.1-f	3.1.1-29	D
Piping and Fittings (Steam Line to HPCI and RCIC Pump Turbine)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 331
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-e	3.1.1-01	

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Small Bore Piping Less than NPS 4)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 331
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 348
		Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to SCC	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	E, 348
				Cracking due to Thermal and Mechanical Loading	Section XI Inservice Inspection and Water Chemistry	IV.C1.1-i	3.1.1-07	I, 348

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 331
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Loss of Material due to FAC	Flow-Accelerated Corrosion	IV.C1.3-a	3.1.1-25	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	
		Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Section XI Inservice Inspection and Water Chemistry			J
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	IV.C1.3-c	3.1.1-29	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.3-d	3.1.1-01	

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Reactor Core Isolation Cooling (RCIC))	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	
				Loss of Material due to FAC	Flow-Accelerated Corrosion	V.D2.1-f	3.2.1-14	D
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
				Cracking due to SCC	Water Chemistry and BWR Stress Corrosion Cracking	V.D2.1-c	3.2.1-16	B
Piping and Fittings (Lines to Suppression Chamber (SC))	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	B
Piping and Fittings (Lines to HPCI and RCIC Pump Turbine)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Lines from HPCI and RCIC Pump Turbines to Torus or Wetwell)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	
				Loss of Material due to FAC	Flow-Accelerated Corrosion	V.D2.1-f	3.2.1-14	B
Piping and Fittings (Piping specialties)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 331
			Lube Oil (Internal)	None	None			J, 334
			Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	D
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Piping specialties) (continued)	M-1	Glass	Indoor Air (External)	None	None			J, 319
			Lube Oil (Internal)	None	None			J, 334
			Treated Water (Internal)	None	None			J, 329
		Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-6	Insulation	Indoor Air (External)	None	None			J, 335
Piping and Fittings (Misc. auxiliary and drain piping and valves)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	D
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	
				Loss of Material due to FAC	Flow-Accelerated Corrosion	V.D2.1-f	3.2.1-14	D

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Misc. auxiliary and drain piping and valves) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-4	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	D
Piping and Fittings (restrictive orifices / flow elements)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	D
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	
				Loss of Material due to FAC	Flow-Accelerated Corrosion	V.D2.1-f	3.2.1-14	D

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (restrictive orifices / flow elements) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Lube Oil (Internal)	None	None			J, 334
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	
	M-3	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Lube Oil (Internal)	None	None			J, 334
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Bowl/Casing)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Suction Head)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B
Pumps (HPCS or HPCI Main and Booster, LPCS, LPCI or RHR, and RCIC) (Discharge Head)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	B

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Check, Control, Hand, Motor Operated, and Relief Valves) (Body and Bonnet)	M-1	Carbon Steel	Lube Oil (Internal)	None	None			J, 334
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	
				Loss of Material due to FAC	Flow-Accelerated Corrosion	V.D2.3-a	3.2.1-14	B
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.3-b	3.2.1-02 3.2.1-04	B
		Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-4	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.3-b	3.2.1-02 3.2.1-04	B
		Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 318
			Indoor Air (External)	None	None			J, 332

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Emergency Core Cooling System (BWR) (Auxiliary Pumps)	M-1	Carbon Steel	Lube Oil (Internal)	None	None			J, 334
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.2-a	3.2.1-02 3.2.1-04	D
		Grey Cast Iron	Treated Water (Internal)	Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
				Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Emergency Core Cooling System (BWR) (Misc. Tanks and Vessels)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	D
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	
				Loss of Material due to FAC	Flow-Accelerated Corrosion	V.D2.1-f	3.2.1-14	D

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Emergency Core Cooling System (BWR) (Steam Turbines)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	V.D2.1-a	3.2.1-02 3.2.1-04	D
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	V.D2.1-b	3.2.1-01	
Auxiliary Heat Exchangers (Auxiliary Heat Exchanger tubing)	M-1	Copper Alloys	Lube Oil (External)	None	None			J, 334
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion Loss of Material due to Selective Leaching	Water Chemistry and One-Time Inspection			J
	M-5	Copper Alloys	Lube Oil (External)	None	None			J, 334
			Treated Water (Internal)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Water Chemistry and One-Time Inspection			J
Auxiliary Heat Exchangers (Auxiliary Heat Exchanger shell / housing)	M-1	Carbon Steel	Lube Oil (Internal)	None	None			J, 334

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Auxiliary Strainers/Filters (Auxiliary Strainer Housing)	M-1	Carbon Steel	Lube Oil (Internal)	None	None			J
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers)	M-1	Carbon Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J, 330
				Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.3.2-2 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Emergency Core Cooling System (BWR) (ECCS Pump Suction Strainers) (continued)	M-2	Carbon Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J, 330
				Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Flow Blockage due to Fouling	Protective Coating Monitoring and Maintenance			J
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E
Pressure Regulators (Body and Bonnet)	M-4	Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 318
			Indoor Air (External)	None	None			J, 332

TABLE 3.3.2-3 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING SAMPLING (RXS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Sample Lines)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and Section XI Inservice Inspection			J, 348
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	IV.C1.1-h	3.1.1-01	
				Cracking due to Thermal and Mechanical Loading	Water Chemistry and Section XI Inservice Inspection	IV.C1.1-i	3.1.1-07	I, 348
Piping (Piping and Fittings)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.3.2-3 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING SAMPLING (RXS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 301
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Heat Exchanger (Shell and Access Cover)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J, 309

TABLE 3.3.2-3 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING SAMPLING (RXS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Flow Orifice (Body)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Pump (Casing)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Filters (Shell and Access Cover)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.3.2-3 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING SAMPLING (RXS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Immersion Element (Pressure Retaining Housing)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Tank (Shell)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.3.2-4 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – POST ACCIDENT SAMPLING SYSTEM (PASS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Indoor Air (Internal)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Valves (Body and Bonnet)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Indoor Air (Internal)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.3.2-4 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – POST ACCIDENT SAMPLING SYSTEM (PASS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Heat Exchanger (Shell and Access Cover)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 322
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J

TABLE 3.3.2-5 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – SCREEN WASH WATER (SCW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 322
			Raw Water (Internal)	Loss of Material due to Erosion Loss of Material due to MIC	One-Time Inspection			J
		Plastics / Polymers	Indoor Air (External)	Cracking due to Various Degradation Mechanisms	Systems Monitoring			J
			Raw Water (Internal)	Cracking due to Various Degradation Mechanisms	One-Time Inspection			J
		Stainless Steel	Indoor Air (External)	None	None			J, 322
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J

TABLE 3.3.2-5 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – SCREEN WASH WATER (SCW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
		Copper Alloys	Indoor Air (External)	None	None			J, 322
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Erosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J

TABLE 3.3.2-5 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – SCREEN WASH WATER (SCW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pump (Casing)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 322
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
Strainer (Body)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J

TABLE 3.3.2-6 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT – SERVICE WATER (SW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings)	M-1	Carbon Steel	Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A
		Copper Alloys	Indoor Air (External)	None	None			J, 332
			Raw Water (Internal)	Loss of Material due to Erosion	Open-Cycle Cooling Water System			H
				Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A
				Loss of Material due to Selective Leaching	Selective Leaching of Materials	VII.C1.1-a	3.3.1-29	B

TABLE 3.3.2-6 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT – SERVICE WATER (SW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A
	M-4	Copper Alloys	Indoor Air (External)	None	None			J, 332
			Raw Water (Internal)	Loss of Material due to Erosion	Open-Cycle Cooling Water System			H
				Loss of Material due to MIC	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A
Piping (Underground Piping and Fittings)	M-1	Carbon Steel	Buried (External)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Buried Piping and Tanks Inspection	VII.C1.1-b	3.3.1-18	B

TABLE 3.3.2-6 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT – SERVICE WATER (SW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Underground Piping and Fittings) (continued)	M-1	Carbon Steel	Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A
		Copper Alloys	Indoor Air (External)	None	None			J, 332
			Raw Water (Internal)	Loss of Material due to Erosion	Open-Cycle Cooling Water System			H
				Flow Blockage due to Fouling Loss of Material due to MIC	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A
Piping (Piping Specialties)	M-1	Plastics / Polymers	Indoor Air (External)	Cracking due to Various Degradation Mechanisms	Systems Monitoring			J
			Raw Water (Internal)	Cracking due to Various Degradation Mechanisms	Open-Cycle Cooling Water System			J

TABLE 3.3.2-6 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT – SERVICE WATER (SW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping Specialties) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System			J
Valves (Body and Bonnet)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 332
			Raw Water (Internal)	Loss of Material due to Erosion	Open-Cycle Cooling Water System			H
				Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.2-a	3.3.1-17	A
				Loss of Material due to Selective Leaching	Selective Leaching of Materials	VII.C1.2-a	3.3.1-29	B

TABLE 3.3.2-6 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT – SERVICE WATER (SW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.2-a	3.3.1-17	A
Heat Exchanger (Service Water Pump Motor Cooler Coils)	M-1	Copper Alloys	Lube Oil (External)	None	None			J, 334
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to MIC	Open-Cycle Cooling Water System	VII.C1.3-b	3.3.1-17	C
	M-5	Copper Alloys	Lube Oil (External)	None	None			J, 334
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Open-Cycle Cooling Water System	VII.C1.3-b	3.3.1-17	C

TABLE 3.3.2-6 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT – SERVICE WATER (SW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Flow Orifice (Body)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.4-a	3.3.1-17	A
	M-3	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.4-a	3.3.1-17	A
Pump (Casing)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System			F

TABLE 3.3.2-6 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT – SERVICE WATER (SW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Basket Strainer (Body)	M-1	Carbon Steel	Raw Water (Internal)	Loss of Material due to Galvanic Corrosion	Open-Cycle Cooling Water System			H
				Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.6-a	3.3.1-17	A
	M-2	Carbon Steel	Raw Water (Internal)	Loss of Material due to Galvanic Corrosion	Open-Cycle Cooling Water System			H
				Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.6-a	3.3.1-17	A

TABLE 3.3.2-6 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT – SERVICE WATER (SW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
CW Strainer (Body Only)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 332
			Raw Water (Internal)	Loss of Material due to Selective Leaching	Selective Leaching of Materials	VII.C1.1-a	3.3.1-29	D
				Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.6-a	3.3.1-17	C

TABLE 3.3.2-7 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING CLOSED COOLING WATER (RBCCW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Reactor Building Closed Cooling Water System								
Piping (Pipe, Fittings, and Flanges)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C2.1-a	3.3.1-15	A
		Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			F, 324
Piping (Piping Specialties)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			F, 324
Valves (Check, Hand, Control, Relief, Solenoid, and Containment Isolation) (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C2.2-a	3.3.1-15	A

TABLE 3.3.2-7 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING CLOSED COOLING WATER (RBCCW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Check, Hand, Control, Relief, Solenoid, and Containment Isolation) (Body and Bonnet) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			F, 324
Pump (Casing)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C2.3-a	3.3.1-15	A
Tank (Shell)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C2.4-a	3.3.1-15	A
Flow Orifice (Body)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C2.5-a	3.3.1-15	A
Closed-Cycle Cooling Water System (Strainers)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C2.1-a	3.3.1-15	C

TABLE 3.3.2-7 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING CLOSED COOLING WATER (RBCCW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Closed-Cycle Cooling Water System (Heat Exchangers)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C2.1-a	3.3.1-15	C, 309
Closed-Cycle Cooling Water System (Piping Specialties)	M-1	Glass	Indoor Air (External)	None	None			J, 319
			Treated Water (Internal)	None	None			J, 329
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 318
			Indoor Air (External)	None	None			J, 325
Pressure Regulators (Body and Bonnet)	M-1	Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 318
			Indoor Air (External)	None	None			J, 332
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Penetration Cooling System								
Piping (Pipe, Fittings, and Flanges)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C2.1-a	3.3.1-15	A

TABLE 3.3.2-7 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING CLOSED COOLING WATER (RBCCW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Check, Hand, Control, Relief, Solenoid, and Containment Isolation) (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C2.2-a	3.3.1-15	A
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.I.1-b	3.3.1-05	E
				Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E

TABLE 3.3.2-8 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Diesel Generator								
Valves, Connected Pipe, Tubing & Fittings	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.H2.2-a	3.3.1-05	E, 323
			Lube Oil (Internal)	None	None			J, 334
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.H2.1-a	3.3.1-15	C
		Copper Alloys	Indoor Air (External)	None	None			J, 301
			Lube Oil (Internal)	None	None			J, 334
		Stainless Steel	Indoor Air (External)	None	None			J, 301
			Lube Oil (Internal)	None	None			J, 334

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Diesel Fuel Oil								
Piping (Aboveground Pipe and Fittings)	M-1	Carbon Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry	VII.H2.5-a	3.3.1-07	E, 306
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring			G, 323
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.H2.2-a	3.3.1-05	E, 323
		Copper Alloys	Indoor Air (External)	None	None			J, 332
			Indoor Air (Internal)	None	None			J, 332
Piping (Underground Pipe and Fittings)	M-1	Carbon Steel	Buried (External)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Buried Piping and Tanks Inspection	VII.H1.1-b	3.3.1-18	B, 310
			Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry	VII.H2.5-a	3.3.1-07	E, 306

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet)	M-1	Carbon Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry	VII.H2.5-a	3.3.1-07	E, 306
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring			G, 323
		Copper Alloys	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry			J
			Indoor Air (External)	None	None			J, 332
		Stainless Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry			J
				Loss of Material due to MIC	Preventive Maintenance			J
			Indoor Air (External)	None	None			J, 325
Pump (Casing)	M-1	Carbon Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry	VII.H2.5-a	3.3.1-07	E, 306
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring			G, 323
Tank (Internal Surface)	M-1	Carbon Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry and One Time Inspection	VII.H1.4-a	3.3.1-07	B, 306
Tank (External Surface)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring			G, 323
Immersion Element (Pressure Retaining Housing)	M-1	Stainless Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry			J
			Indoor Air (External)	None	None			J, 325

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Strainer (Body)	M-1	Carbon Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry	VII.H2.5-a	3.3.1-07	E, 306
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Tanks (Day and Drip)	M-1	Carbon Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry and One Time Inspection	VII.H2.5-a	3.3.1-07	B, 306
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Filters (Shell)	M-1	Carbon Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry	VII.H2.5-a	3.3.1-07	E, 306
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Diesel Lube Oil System								
Valves, Connected Pipe, Tubing & Fittings	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.H2.2-a	3.3.1-05	E, 323
			Lube Oil (Internal)	None	None			J, 334
		Copper Alloys	Indoor Air (External)	None	None			J, 301
			Lube Oil (Internal)	None	None			J, 334

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Heaters & Thermowells (Housing)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Lube Oil (Internal)	None	None			J, 334
Filter (Shell)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Lube Oil (Internal)	None	None			J, 334
Pump (Casing)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Lube Oil (Internal)	None	None			J, 334
Gauge Glass	M-1	Glass	Indoor Air (External)	None	None			J, 301
			Lube Oil (Internal)	None	None			J, 334
Heat Exchanger (Tubes)	M-1	Copper Alloys	Lube Oil (External)	None	None			J, 334
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Heat Exchanger (Tubes) (continued)	M-5	Copper Alloys	Lube Oil (External)	None	None			J, 334
			Treated Water (Internal)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Closed-Cycle Cooling Water System			J
Heat Exchanger (Shell)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Lube Oil (Internal)	None	None			J, 334
Heat Exchanger (Tube Sheet & Channel Head)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			J
Strainer (Casing)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Lube Oil (Internal)	None	None			J, 334
Strainer (Screen)	M-2	Strainer Element	Lube Oil (External)	Change in Material Properties due to Various Degradation Mechanisms Flow Blockage due to Fouling	Preventive Maintenance			J

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Diesel Jacket Water System								
Heat Exchanger (Shell)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C1.3-a	3.3.1-17	E
Heat Exchanger (Channel)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C1.3-a	3.3.1-17	E
Heat Exchanger (Channel Head and Access Cover)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C1.3-a	3.3.1-17	E
		Copper Alloys	Raw Water (Internal)	Loss of Material due to MIC	Open-Cycle Cooling Water System	VII.C1.3-a	3.3.1-17	A
Heat Exchanger (Tubesheet)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C1.3-a	3.3.1-17	E

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Heat Exchanger (Tubesheet) (continued)	M-1	Copper Alloys	Raw Water (Internal)	Loss of Material due to Erosion	Open-Cycle Cooling Water System			H
				Loss of Material due to Galvanic Corrosion Loss of Material due to MIC	Open-Cycle Cooling Water System	VII.C1.3-a	3.3.1-17	A
	M-5	Copper Alloys	Raw Water (Internal)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Open-Cycle Cooling Water System			H
Heat Exchanger (Tubes)	M-1	Copper Alloys	Raw Water (Internal)	Loss of Material due to Erosion	Open-Cycle Cooling Water System			H
				Loss of Material due to MIC	Open-Cycle Cooling Water System	VII.C1.3-a	3.3.1-17	A
				Loss of Material due to Galvanic Corrosion	Open-Cycle Cooling Water System	VII.C1.3-b	3.3.1-17	A
	M-5	Copper Alloys	Raw Water (Internal)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Open-Cycle Cooling Water System	VII.C1.3-b	3.3.1-17	A
Piping (Pipe, Fittings, and Flanges)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 325

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Check, Hand, Control, Relief, Solenoid, and Containment Isolation) (Body and Bonnet)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
Closed-Cycle Cooling Water System (Piping Specialties)	M-1	Glass	Indoor Air (External)	None	None			J, 319
			Treated Water (Internal)	None	None			J, 329
		Stainless Steel	Indoor Air (External)	None	None			J, 325
Diesel Engine Cooling Water Subsystem (Pipe and Fittings)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Galvanic Corrosion	Closed-Cycle Cooling Water System			H
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.H2.1-a	3.3.1-15	A
		Glass	Indoor Air (External)	None	None			J, 319
			Treated Water (Internal)	None	None			J, 329

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Diesel Engine Cooling Water Subsystem (Pipe and Fittings) (continued)	M-1	Grey Cast Iron	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
		Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			F, 324
	M-3	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			F, 324
	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			F, 324

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Diesel Engine Cooling Water Subsystem (Tanks and Vessels)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			J
		Stainless Steel	Indoor Air (External)	None	None			J
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			J
Diesel Engine Cooling Water Subsystem (Heat Exchangers)	M-1	Copper Alloys	Indoor Air (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Diesel Engine Cooling Water Subsystem (Heat Exchangers) (continued)	M-5	Copper Alloys	Indoor Air (External)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Preventive Maintenance			J
			Treated Water (Internal)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Closed-Cycle Cooling Water System			J
Diesel Engine Cooling Water Subsystem (Pumps)	M-1	Grey Cast Iron	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
Diesel Engine Cooling Water Subsystem (Piping Specialties)	M-1	Glass	Indoor Air (External)	None	None			J, 319
			Treated Water (Internal)	None	None			J, 329
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
DG Service Water System								
Piping (Piping and Fittings)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A
		Copper Alloys	Indoor Air (External)	None	None			J, 332
			Raw Water (Internal)	Loss of Material due to Erosion	Open-Cycle Cooling Water System			H
				Flow Blockage due to Fouling Loss of Material due to MIC	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	A

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping Specialties)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.1-a	3.3.1-17	C
Valves (Body and Bonnet)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 332
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.2-a	3.3.1-17	A
				Loss of Material due to Selective Leaching	Selective Leaching of Materials	VII.C1.2-a	3.3.1-29	B

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 325
			Raw Water (Internal)	Flow Blockage due to Fouling Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Open-Cycle Cooling Water System	VII.C1.2-a	3.3.1-17	A
DG Starting Air System								
Pipe and Fittings	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.H2.2-a	3.3.1-05	E, 323
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.H2.2-a	3.3.1-05	E, 323
Valves (Hand and Check)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.I.1-b	3.3.1-05	E
				Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.H2.2-a	3.3.1-05	E, 323
				Loss of Material due to General Corrosion	Preventive Maintenance	VII.H2.2-a	3.3.1-05	E, 323

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Hand and Check) (continued)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 322
			Indoor Air (Internal)	None	None			J, 322
		Stainless Steel	Indoor Air (External)	None	None			J, 322
			Indoor Air (Internal)	None	None			J, 322
Drain Trap	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.H2.2-a	3.3.1-05	E, 323
		Copper Alloys	Indoor Air (External)	None	None			J, 322
			Indoor Air (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Preventive Maintenance			F
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			F
Air Accumulator Vessel	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.H2.2-a	3.3.1-05	E, 323
Filter (Shell)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.H2.2-a	3.3.1-05	E, 323

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Strainer (Shell)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.H2.2-a	3.3.1-05	E, 323
Strainer (Basket)	M-2	Filter Media	Dry Air / Gas (External)	Flow Blockage due to Fouling	Preventive Maintenance			J, 336
		Stainless Steel	Indoor Air (External)	None	None			J, 322
DG Intake/Exhaust System								
Piping and Fittings	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.H2.3-a	3.3.1-05	E, 323
Filter	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.H2.3-a	3.3.1-05	E, 323
Muffler (Intake Silencer)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.H2.3-a	3.3.1-05	E, 323
Turbo Charger (inlet-housing)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.H2.3-a	3.3.1-05	E, 323

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valve (Body), connected piping, tubing and fittings	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.H2.3-a	3.3.1-05	E, 323
Turbo Charger (inlet-bellows)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 322
			Indoor Air (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	One-Time Inspection			J
Filter (media)	M-2	Strainer Element	Lube Oil (External)	Change in Material Properties due to Various Degradation Mechanisms Flow Blockage due to Fouling	Preventive Maintenance			J
Piping and Fittings	M-1	Carbon Steel	Diesel Exhaust Gas (Internal)	Loss of Material due to General, Crevice and Pitting Corrosion	One-Time Inspection	VII.H2.4-a	3.3.1-05	E
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Muffler (Exhaust)	M-4	Carbon Steel	Diesel Exhaust Gas (Internal)	Loss of Material due to General, Crevice and Pitting Corrosion	One-Time Inspection	VII.H2.4-a	3.3.1-05	E
			Outdoor Air (External)	Loss of Material due to Aggressive Chemical Attack Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Systems Monitoring			J
Fans (Housing)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Lube Oil (Internal)	None	None			J, 334
Oil Separator (Housing)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Lube Oil (Internal)	None	None			J, 334

TABLE 3.3.2-8 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR (DG) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valve (body), Connected Pipe & Fittings	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Lube Oil (Internal)	None	None			J, 334
Turbo Charger (exhaust-housing)	M-1	Carbon Steel	Diesel Exhaust Gas (Internal)	Loss of Material due to General, Crevice and Pitting Corrosion	One-Time Inspection	VII.H2.4-a	3.3.1-05	E
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Turbo Charger (exhaust-bellows)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 322
			Indoor Air (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	One-Time Inspection			J

TABLE 3.3.2-9 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – HEAT TRACING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Steam Drains)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	One-Time Inspection	VIII.B2.1-a	3.4.1-07	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.B2.1-c	3.4.1-01	
Valves (Check, Control, Hand, Motor Operated, Safety Valves) (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.B2.1-c	3.4.1-01	
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	One-Time Inspection	VIII.B2.2-b	3.4.1-07	E
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VIII.H.1-b	3.4.1-05	E

TABLE 3.3.2-10 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – INSTRUMENT AIR (IA) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings)	M-1	Carbon Steel	Dry Air / Gas (Internal)	None	None			G, 308
		Copper Alloys	Dry Air / Gas (Internal)	None	None			F, 308
		Stainless Steel	Dry Air / Gas (Internal)	None	None			F, 308
	M-4	Carbon Steel	Dry Air / Gas (Internal)	None	None			G, 308
			Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection	VII.D.1-a	3.3.1-19	E
		Stainless Steel	Dry Air / Gas (Internal)	None	None			F, 308
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1	Aluminum Alloys	Dry Air / Gas (Internal)	None	None			F, 308
		Carbon Steel	Dry Air / Gas (Internal)	None	None			G, 308
		Carbon Steel - Galvanized	Indoor Air (Internal)	None	None			F, 301
		Copper Alloys	Dry Air / Gas (Internal)	None	None			F, 308
		Stainless Steel	Dry Air / Gas (Internal)	None	None			F, 308
	M-4	Carbon Steel	Dry Air / Gas (Internal)	None	None			G, 308
		Stainless Steel	Dry Air / Gas (Internal)	None	None			F, 308

TABLE 3.3.2-10 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – INSTRUMENT AIR (IA) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Air Receiver (Shell and Access Cover)	M-1	Carbon Steel	Dry Air / Gas (Internal)	None	None			G, 308
Pressure Regulators (Body and Bonnet)	M-4	Carbon Steel - Galvanized	Indoor Air (Internal)	None	None			F, 301
Filter (Shell and Access Cover)	M-1	Stainless Steel	Dry Air / Gas (Internal)	None	None			F, 308
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Non-Carbon Steel Components (External Surfaces)	M-1	Aluminum Alloys	Indoor Air (External)	None	None			J, 301
		Carbon Steel - Galvanized	Indoor Air (External)	None	None			J, 301
		Copper Alloys	Indoor Air (External)	None	None			J, 301
		Stainless Steel	Indoor Air (External)	None	None			J, 301
	M-4	Carbon Steel - Galvanized	Indoor Air (External)	None	None			J, 301
		Stainless Steel	Indoor Air (External)	None	None			J, 301

TABLE 3.3.2-11 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – PNEUMATIC NITROGEN SYSTEM (PNS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings)	M-4	Stainless Steel	Dry Air / Gas (Internal)	None	None			F, 308
Valves (including check valves and containment isolation) (Body and Bonnet)	M-4	Stainless Steel	Dry Air / Gas (Internal)	None	None			F, 308
Filter (Shell and Access Cover)	M-4	Aluminum Alloys	Dry Air / Gas (Internal)	None	None			F, 308
Non-Carbon Steel Components (External Surfaces)	M-4	Aluminum Alloys	Indoor Air (External)	None	None			J, 301
		Stainless Steel	Indoor Air (External)	None	None			J, 301

TABLE 3.3.2-12 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FIRE PROTECTION (FP) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Fire Protection Water								
Piping and Fittings (Includes Carbon Steel Fire Water Tank)	M-1	Aluminum Alloys	Raw Water (Internal)	Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Fire Water System			F
		Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Fire Water System	VII.G.6-a	3.3.1-21	A, 343
		Glass	Raw Water (Internal)	None	None			F, 320
		Stainless Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Fire Water System	VII.G.6-a	3.3.1-21	A

TABLE 3.3.2-12 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FIRE PROTECTION (FP) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (continued)	M-3	Stainless Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Fire Water System	VII.G.6-a	3.3.1-21	A
Filter, Fire Hydrants, Mulsifier, Pump Casing, Sprinkler, Strainer, and Valve Bodies (including containment isolation valves)	M-1	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Fire Water System	VII.G.6-b	3.3.1-21	A, 342
		Copper Alloys	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Fire Water System	VII.G.6-b	3.3.1-21	A, 342, 343
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			H

TABLE 3.3.2-12 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FIRE PROTECTION (FP) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Filter, Fire Hydrants, Mulsifier, Pump Casing, Sprinkler, Strainer, and Valve Bodies (including containment isolation valves) (continued)	M-1	Grey Cast Iron	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Fire Water System	VII.G.6-b	3.3.1-21	A, 342
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			H
		Stainless Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Fire Water System	VII.G.6-b	3.3.1-21	A, 342
	M-8	Copper Alloys	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Fire Water System	VII.G.6-b	3.3.1-21	A, 342, 343
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			H

TABLE 3.3.2-12 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FIRE PROTECTION (FP) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
HTX - Heat Exchanger Shell and Access Cover	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Fire Protection			J
HTX - Heat Exchanger Tubes	M-1	Copper Alloys	Raw Water (Internal)	Loss of Material due to Erosion Loss of Material due to Galvanic Corrosion Loss of Material due to MIC	Fire Water System	VII.G.6-b	3.3.1-21	C
			Treated Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Fire Protection			J
	M-5	Copper Alloys	Raw Water (Internal)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Fire Water System			J
			Treated Water (External)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Fire Protection			J

TABLE 3.3.2-12 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FIRE PROTECTION (FP) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Diesel-Driven Fire Pump and Fuel Supply Line	M-1	Grey Cast Iron	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Fire Water System	VII.G.6-b	3.3.1-21	C, 344
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			H, 344
Carbon Steel Components (External Surfaces) (Includes Carbon Steel Fire Water Tank)	M-1	Carbon Steel	Buried (External)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Buried Piping and Tanks Inspection			G
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Outdoor Air (External)	Loss of Material due to General Corrosion	Aboveground Carbon Steel Tanks	VII.I.1-b	3.3.1-05	E

TABLE 3.3.2-12 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FIRE PROTECTION (FP) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Carbon Steel Components (External Surfaces) (continued)	M-1	Carbon Steel - Galvanized	Indoor Air (External)	None	None			J, 322
			Outdoor Air (External)	Loss of Material due to Aggressive Chemical Attack Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E, 345
		Grey Cast Iron	Buried (External)	Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Buried Piping and Tanks Inspection			G
Non-Carbon Steel Components (External Surfaces)	M-1	Aluminum Alloys	Indoor Air (External)	None	None			J, 322
		Copper Alloys	Indoor Air (External)	None	None			J, 322
		Glass	Indoor Air (External)	None	None			J, 319
		Stainless Steel	Indoor Air (External)	None	None			J, 322

TABLE 3.3.2-12 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FIRE PROTECTION (FP) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Fire Protection CO_2								
CO2 Fire Suppression (HPCI)	M-1	Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 318
		Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 318
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
		Carbon Steel - Galvanized	Indoor Air (External)	None	None			J, 322
Non-Carbon Steel Components (External Surfaces)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 322
Halon System								
Halon Fire Suppression (DGB)	M-1	Aluminum Alloys	Dry Air / Gas (Internal)	None	None			J, 318
		Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 318
		Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 318
		Stainless Steel	Dry Air / Gas (Internal)	None	None			J, 318

TABLE 3.3.2-12 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FIRE PROTECTION (FP) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Non-Carbon Steel Components (External Surfaces)	M-1	Aluminum Alloys	Indoor Air (External)	None	None			J, 322
		Copper Alloys	Indoor Air (External)	None	None			J, 322
		Stainless Steel	Indoor Air (External)	None	None			J, 322

TABLE 3.3.2-13 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FUEL OIL (FO) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Diesel-Driven Fire Pump and Fuel Supply Line	M-1	Carbon Steel	Buried (External)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Buried Piping and Tanks Inspection			J, 310
			Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry	VII.H2.5-a	3.3.1-07	E, 306
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Valves Body and Tubing	M-1	Copper Alloys	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry and Fire Protection			J, 347
			Indoor Air (External)	None	None			J, 332
Diesel Fuel Tank	M-1	Carbon Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry and One Time Inspection	VII.H1.4-a	3.3.1-07	D, 306
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E

TABLE 3.3.2-13 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FUEL OIL (FO) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Aboveground Pipe and Fittings)	M-1	Carbon Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry	VII.H2.5-a	3.3.1-07	E, 306
			Outdoor Air (External)	Loss of Material due to Aggressive Chemical Attack Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Systems Monitoring	VII.H1.1-a	3.3.1-05	E, 346
Valves (Body and Bonnet)	M-1	Carbon Steel	Fuel Oil (Internal)	Loss of Material due to MIC	Fuel Oil Chemistry	VII.H2.5-a	3.3.1-07	E, 306
			Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Outdoor Air (External)	Loss of Material due to Aggressive Chemical Attack Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Systems Monitoring	VII.H1.2-a	3.3.1-05	E, 346

TABLE 3.3.2-13 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FUEL OIL (FO) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Tank (Internal Surface)	M-1	Carbon Steel	Fuel Oil (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Fuel Oil Chemistry and One Time Inspection	VII.H1.4-a	3.3.1-07	B
Tank (External Surface)	M-1	Carbon Steel	Outdoor Air (External)	Loss of Material due to Aggressive Chemical Attack Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Aboveground Carbon Steel Tanks	VII.H1.4-b	3.3.1-23	A, 346

TABLE 3.3.2-14 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – RADIOACTIVE FLOOR DRAINS SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Drain System Sump Pumps	M-1	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
		Grey Cast Iron	Raw Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J

TABLE 3.3.2-14 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – RADIOACTIVE FLOOR DRAINS SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Drain System Sump Pumps (continued)	M-1	Grey Cast Iron	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
Piping (Piping and Fittings)	M-1	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J

TABLE 3.3.2-14 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – RADIOACTIVE FLOOR DRAINS SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings) (continued)	M-1	Stainless Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
	M-4	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
Valves (Body and Bonnet)	M-1	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J

TABLE 3.3.2-14 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – RADIOACTIVE FLOOR DRAINS SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet) (continued)	M-1	Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 318
		Stainless Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
	M-4	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J

TABLE 3.3.2-14 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – RADIOACTIVE FLOOR DRAINS SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Flow Orifice (Body)	M-1	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J, 340
		Stainless Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J, 340
	M-4	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J, 340
		Stainless Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J, 340

TABLE 3.3.2-14 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – RADIOACTIVE FLOOR DRAINS SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pump (Casing)	M-1	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
		Grey Cast Iron	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
		Stainless Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J

TABLE 3.3.2-14 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – RADIOACTIVE FLOOR DRAINS SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Tank (Shell)	M-1	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
Non-Carbon Steel Components (External Surfaces)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 322
		Stainless Steel	Indoor Air (External)	None	None			J, 322
	M-4	Stainless Steel	Indoor Air (External)	None	None			J, 322

TABLE 3.3.2-15 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – RADIOACTIVE EQUIPMENT DRAINS SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Piping (Piping and Fittings)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Valves (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 318
		Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.3.2-15 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – RADIOACTIVE EQUIPMENT DRAINS SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Heat Exchanger (Shell and Access Cover)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J, 309
Flow Orifice (Body)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-3	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.3.2-15 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – RADIOACTIVE EQUIPMENT DRAINS SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pump (Casing)	M-1	Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Tank (Shell)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Non-Carbon Steel Components (External Surfaces)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 322
		Stainless Steel	Indoor Air (External)	None	None			J, 322

TABLE 3.3.2-16 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – MAKEUP WATER TREATMENT SYSTEM (MWTS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Water Treatment System								
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Piping (Piping and Fittings)	M-1	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
Valves (Body and Bonnet)	M-1	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
		Stainless Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J

TABLE 3.3.2-16 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – MAKEUP WATER TREATMENT SYSTEM (MWTS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Carbon Steel Components (External Surfaces)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 322
Demineralized Water System								
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Piping (Piping and Fittings)	M-1	Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Valves (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Grey Cast Iron	Treated Water (Internal)	Loss of Material due to Selective Leaching	Selective Leaching of Materials			J

TABLE 3.3.2-16 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – MAKEUP WATER TREATMENT SYSTEM (MWTS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet) (continued)	M-1	Grey Cast Iron	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Tank (Shell)	M-1	Aluminum Alloys	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Galvanic Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Non-Carbon Steel Components (External Surfaces)	M-1	Aluminum Alloys	Outdoor Air (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Systems Monitoring			J
		Stainless Steel	Indoor Air (External)	None	None			J, 322

TABLE 3.3.2-17 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – POTABLE WATER SYSTEM (PWS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings)	M-1	Copper Alloys	Raw Water (Internal)	Loss of Material due to MIC	One-Time Inspection			J
Valves (Body and Bonnet)	M-1	Copper Alloys	Raw Water (Internal)	Loss of Material due to MIC	One-Time Inspection			J
Tank (Shell)	M-1	Copper Alloys	Raw Water (Internal)	Loss of Material due to MIC	One-Time Inspection			J
Non-Carbon Steel Components (External Surfaces)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 322

TABLE 3.3.2-18 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – PROCESS RADIATION MONITORING (PRM) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Closed-Cycle Cooling Water System (Piping Specialties)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.C2.1-a	3.3.1-15	C
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 341

TABLE 3.3.2-19 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – LIQUID WASTE PROCESSING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Piping (Piping and Fittings)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
	M-4	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J

TABLE 3.3.2-19 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – LIQUID WASTE PROCESSING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet)	M-1	Carbon Steel	Dry Air / Gas (Internal)	None	None			J, 318
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Immersion Element (Pressure Retaining Housing)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Tank (Shell)	M-1	Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Non-Carbon Steel Components (External Surfaces)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 322

TABLE 3.3.2-20 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FUEL POOL COOLING AND CLEANUP SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping, Fittings, and Flanges)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
		Glass	Treated Water (Internal)	None	None			F, 329
		Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VII.A4.1-a	3.3.1-01	B
	M-3	Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VII.A4.1-a	3.3.1-01	B
Valves (Check and Hand Valves) (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
		Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VII.A4.3-a	3.3.1-01	B

TABLE 3.3.2-20 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FUEL POOL COOLING AND CLEANUP SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Heat Exchanger (Shell and Access Cover)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Closed-Cycle Cooling Water System	VII.A4.4-a	3.3.1-15	A. 309
Heat Exchanger (Channel Head and Access Cover)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VII.A4.4-b	3.3.1-01	B, 309
Pump (Casing)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E

TABLE 3.3.2-20 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FUEL POOL COOLING AND CLEANUP SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Carbon Steel Components (External Surfaces)	M-1	Glass	Indoor Air (External)	None	None			J, 319
		Stainless Steel	Indoor Air (External)	None	None			J, 322
			Treated Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VII.A4.1-a	3.3.1-01	D, 339

TABLE 3.3.2-21 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC DIESEL GENERATOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings)	M-1	Copper Alloys	Dry Air / Gas (Internal)	None	None			G, 308
		Plastics / Polymers	Indoor Air (Internal)	Cracking due to Various Degradation Mechanisms	Preventive Maintenance			F
	M-4	Copper Alloys	Dry Air / Gas (Internal)	None	None			G, 308
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1	Aluminum Alloys	Dry Air / Gas (Internal)	None	None			F, 308
	M-4	Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 308
Air Receiver (Shell and Access Cover)	M-4	Carbon Steel	Dry Air / Gas (Internal)	None	None			G, 304
		Copper Alloys	Dry Air / Gas (Internal)	None	None			G, 304
Duct (Duct, Fittings, Fan Housings, Damper Housings, Access Doors, and Closure Bolts)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.F4.1-a	3.3.1-05	E, 302
		Carbon Steel - Galvanized	Indoor Air (Internal)	None	None	VII.F4.1-a	3.3.1-05	I, 303
		Plastics / Polymers	Indoor Air (Internal)	None	None			F, 305
		Stainless Steel	Outdoor Air (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Preventive Maintenance			F
	M-4	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.F4.1-a	3.3.1-05	E, 302

TABLE 3.3.2-21 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC DIESEL GENERATOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Duct (Equipment Frames and Housing)	M-1	Carbon Steel - Galvanized	Outdoor Air (Internal)	Loss of Material due to Aggressive Chemical Attack Loss of Material due to General Corrosion	Preventive Maintenance			G, 302
Duct (Seals in Dampers and Doors)	M-1	Elastomers	Indoor Air (Internal)	Cracking due to Various Degradation Mechanisms	Preventive Maintenance	VII.F4.1-b	3.3.1-02	E
				Loss of Material due to Wear	Preventive Maintenance	VII.F4.1-c	3.3.1-02	E
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Outdoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring			J
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Non-Carbon Steel Components (External Surfaces)	M-1	Aluminum Alloys	Indoor Air (External)	None	None			J, 301
		Carbon Steel - Galvanized	Indoor Air (External)	None	None			J, 303
		Copper Alloys	Indoor Air (External)	None	None			J, 313
		Elastomers	Indoor Air (External)	Cracking due to Various Degradation Mechanisms Loss of Material due to Wear	Systems Monitoring			J

TABLE 3.3.2-21 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC DIESEL GENERATOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Carbon Steel Components (External Surfaces) (continued)	M-1	Plastics / Polymers	Indoor Air (External)	Cracking due to Various Degradation Mechanisms	Systems Monitoring			J
	M-4	Copper Alloys	Indoor Air (External)	None	None			J, 313

TABLE 3.3.2-22 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC REACTOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings)	M-1	Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 308
Valves (including check valves and containment isolation) (Body and Bonnet)	M-1	Aluminum Alloys	Dry Air / Gas (Internal)	None	None			F, 308
		Copper Alloys	Dry Air / Gas (Internal)	None	None			J, 308
	M-4	Aluminum Alloys	Dry Air / Gas (Internal)	None	None			F, 308
Air Receiver (Shell and Access Cover)	M-1	Carbon Steel	Dry Air / Gas (Internal)	None	None			G, 308
Duct (Duct Fittings, Access Doors, Damper Housings and Closure Bolts)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.F3.1-a	3.3.1-05	E, 302
		Carbon Steel - Galvanized	Indoor Air (Internal)	None	None			J, 303
				Loss of Material due to General Corrosion	Preventive Maintenance			E, 302
		Plastics / Polymers	Indoor Air (Internal)	None	None			F, 305
	M-4	Carbon Steel - Galvanized	Indoor Air (Internal)	None	None			J, 303
Duct (Equipment Frames and Housing, including Fan Housings)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.F3.1-a	3.3.1-05	E, 302

TABLE 3.3.2-22 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC REACTOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Duct (Flexible Collars between Ducts and Fans)	M-1	Elastomers	Indoor Air (Internal)	Cracking due to Various Degradation Mechanisms	Preventive Maintenance	VII.F3.1-b	3.3.1-02	E
				Loss of Material due to Wear	Preventive Maintenance	VII.F3.1-c	3.3.1-02	E
		Stainless Steel	Indoor Air (Internal)	None	None			F, 301
Duct (Seals in Dampers and Doors)	M-1	Elastomers	Indoor Air (Internal)	Cracking due to Various Degradation Mechanisms	Preventive Maintenance	VII.F3.1-b	3.3.1-02	E
				Loss of Material due to Wear	Preventive Maintenance	VII.F3.1-c	3.3.1-02	E
Air Handler Heating/Cooling (Heating/Cooling Coils)	M-1	Copper Alloys	Raw Water (Internal)	Loss of Material due to Erosion Loss of Material due to Galvanic Corrosion Loss of Material due to MIC	Open-Cycle Cooling Water System			G
	M-5	Copper Alloys	Raw Water (Internal)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Open-Cycle Cooling Water System			G
Piping (Piping and Fittings)	M-4	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance			G
Filters (Housing and Supports)	M-1	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.F3.4-a	3.3.1-05	E, 315

TABLE 3.3.2-22 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC REACTOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Filters (Elastomer Seals)	M-1	Elastomers	Indoor Air (Internal)	Loss of Material due to Wear	Preventive Maintenance			J
				Cracking due to Various Degradation Mechanisms	Preventive Maintenance	VII.F3.4-b	3.3.1-02	E
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
			Outdoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring			G
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E
Non-Carbon Steel Components (External Surfaces)	M-1	Aluminum Alloys	Indoor Air (External)	None	None			J, 301
		Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring			J, 312
		Carbon Steel - Galvanized	Indoor Air (External)	None	None			J, 301
		Copper Alloys	Indoor Air (External)	None	None			J, 313
		Elastomers	Indoor Air (External)	Cracking due to Various Degradation Mechanisms Loss of Material due to Wear	Systems Monitoring			J
		Plastics / Polymers	Indoor Air (External)	None	None			J, 301

TABLE 3.3.2-22 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – HVAC REACTOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Carbon Steel Components (External Surfaces) (continued)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 301
			Outdoor Air (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Systems Monitoring			J
	M-4	Aluminum Alloys	Indoor Air (External)	None	None			J, 301
		Carbon Steel - Galvanized	Indoor Air (External)	None	None			J, 303
Non-Carbon Steel Components (External Surfaces) (Heat Exchanger)	M-1	Copper Alloys	Indoor Air (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
	M-5	Copper Alloys	Indoor Air (External)	Loss of Heat Transfer Effectiveness due to Fouling of Heat Transfer Surfaces	Preventive Maintenance			J

TABLE 3.3.2-23 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – TORUS DRAIN SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Misc. auxiliary and drain piping and valves)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
		Stainless Steel	Indoor Air (External)	None	None			J, 325
			Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			J
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	V.E.1-b	3.2.1-10	E

TABLE 3.3.2-24 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – CIVIL STRUCTURE AUXILIARY SYSTEMS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Primary Containment Auxiliary Systems								
Piping (Piping and Fittings)	M-1	Stainless Steel	Indoor Air (External)	None	None	V.C.1-b	3.2.1-05 3.2.1-06	I, 322, 338
			Indoor Air (Internal)	None	None	V.C.1-b	3.2.1-05 3.2.1-06	I, 322, 338
Valves (Body and Bonnet)	M-1	Stainless Steel	Indoor Air (External)	None	None	V.C.1-b	3.2.1-05 3.2.1-06	I, 322, 338
			Indoor Air (Internal)	None	None	V.C.1-b	3.2.1-05 3.2.1-06	I, 322, 338
Service Water Intake Structure Auxiliary Systems								
Piping (Piping and Fittings)	M-1	Plastics / Polymers	Indoor Air (External)	None	None			J, 322
			Raw Water (Internal)	None	None			J, 320
Valves (Body and Bonnet)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 322
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J

TABLE 3.3.2-24 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – CIVIL STRUCTURE AUXILIARY SYSTEMS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pump (Casing)	M-1	Grey Cast Iron	Raw Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J

TABLE 3.3.2-24 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – CIVIL STRUCTURE AUXILIARY SYSTEMS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Gauge Glasses (Pressure Retaining Housing)	M-1	Copper Alloys	Indoor Air (External)	None	None			J, 322
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
		Glass	Indoor Air (External)	None	None			J, 322
			Raw Water (Internal)	None	None			J, 320

TABLE 3.3.2-24 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – CIVIL STRUCTURE AUXILIARY SYSTEMS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Diesel Generator Building Auxiliary Systems								
Piping (Piping and Fittings)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.I.1-b	3.3.1-05	E
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
Valves (Body and Bonnet)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.I.1-b	3.3.1-05	E
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
Pump (Casing)	M-1	Grey Cast Iron	Raw Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J

TABLE 3.3.2-24 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – CIVIL STRUCTURE AUXILIARY SYSTEMS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pump (Casing) (continued)	M-1	Grey Cast Iron	Raw Water (External)	Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
Control Building Auxiliary Systems								
Piping (Piping and Fittings)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.I.1-b	3.3.1-05	E
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J

TABLE 3.3.2-24 (continued) AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – CIVIL STRUCTURE AUXILIARY SYSTEMS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Preventive Maintenance	VII.I.1-b	3.3.1-05	E
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
Pump (Casing)	M-1	Grey Cast Iron	Raw Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
			Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Preventive Maintenance			J
				Loss of Material due to Selective Leaching	Selective Leaching of Materials			J

TABLE 3.3.2-25 AUXILIARY SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – NON-CONTAMINATED WATER DRAINAGE SYSTEM (NCWDS)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping (Piping and Fittings)	M-1	Carbon Steel	Raw Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	One-Time Inspection			J
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VII.I.1-b	3.3.1-05	E

Notes for Tables 3.3.2-1 through 3.3.2-26:

Generic Notes:

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E. Consistent with NUREG-1801 for material, environment, and aging effect, but a different AMP is credited.
F. Material not in NUREG-1801 for this component.
G. Environment not in NUREG-1801 for this component and material.
H. Aging effect not in NUREG 1801 for this component, material, and environment combination.
I. Aging effect in NUREG-1801 for this component, material, and environment combination is not applicable.
J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific Notes:

301. The BSEP AMR methodology concluded that the subject material in an Indoor Air environment and the absence of moisture has no aging effects.
302. NUREG-1801 identified potential aging effects/mechanisms that were not predicted by BSEP AMR methodology. Crevice and pitting corrosion are not applicable due to the lack of sustained wetting and aggressive chemical species required to produce these aging mechanisms. MIC has not been observed in BSEP HVAC environments.
303. NUREG-1801 identified potential aging effects/mechanisms that were not predicted by BSEP AMR methodology. General, crevice, and pitting corrosion are not applicable due to the lack of sustained wetting and aggressive chemical species required to produce these aging mechanisms. MIC has not been observed in BSEP HVAC environments.
304. Components in this item contain dry compressed nitrogen supplied from bottles. The BSEP AMR methodology concluded that the subject material and environment combination has no aging effects.
305. The BSEP AMR methodology concluded that the subject non-metallic material in an Indoor Air environment has no aging effects/aging mechanisms.

306. The BSEP AMR methodology does not predict general, pitting, or crevice corrosion or biofouling in fuel oil without the possibility of water pooling. The BSEP fuel oil storage system has no history of water intrusion or particulate contamination. The Fuel Oil Chemistry Program is confirmed using one-time inspections of fuel storage tanks.
307. The component environment is Indoor Air in piping.
308. The commodity identifies compressed air/gas components used for pneumatic controls. The BSEP design includes air dryers to ensure that moisture does not cause corrosion for the components in this item (Ref. NUREG-1801, VII.D). The BSEP AMR methodology predicts no aging effects for the subject material in a dry air/gas environment.
309. The heat exchanger(s) in question are only in-scope for potential spatial interactions with safety-related components. As such, only the heat exchanger shell requires an aging management review. The heat exchanger tubes do not have an intended function requiring aging management.
310. The BSEP AMR methodology does not predict galvanic corrosion for coated underground piping.
311. Not used.
312. Components on this line are constructed of cast iron.
313. NUREG-1801 (VII.F) identified potential aging effects/mechanisms. The BSEP AMR methodology predicts no aging effects for the subject material and environment. Crevice and pitting corrosion are not applicable due to the lack of sustained wetting and aggressive chemical species required to produce these aging mechanisms.
314. Loss of material due to crevice and pitting corrosion is predicted by the BSEP AMR methodology but not by NUREG-1801.
315. NUREG-1801 identified potential aging effects/mechanisms. Crevice and pitting corrosion are not applicable due to the lack of sustained wetting and aggressive chemical species required to produce these aging mechanisms.
316. NUREG-1801 (VII.D) identified potential aging effects/mechanisms. The BSEP AMR methodology predicted that pitting corrosion is not applicable due to the lack of sustained wetting and aggressive chemical species required to produce this aging mechanism.
317. The BSEP AMR methodology concluded that aluminum in an Indoor Air environment has no aging effects.
318. The BSEP AMR methodology concluded that the subject material exposed to dry air or gas exhibits no aging effects.
319. The BSEP AMR methodology concluded that glass in an Indoor Air environment exhibits no aging effects.
320. The BSEP AMR methodology concluded that glass or PVC in a raw water environment exhibits no aging effects.
321. The fire protection program provides further confirmation that diesel fire pump fuel supply line is free of obstructions.
322. The BSEP AMR methodology concluded that the subject material in an Indoor Air environment exhibits no aging effects.
323. NUREG-1801 identified potential aging effects/mechanisms that were not predicted by the BSEP AMR methodology. Crevice and pitting corrosion are not applicable due to the lack of sustained wetting and aggressive chemical species required to produce these aging mechanisms.
324. Stainless steel is not evaluated by NUREG-1801 in this situation.
325. The BSEP AMR methodology concluded that stainless steel in an Indoor Air environment has no aging effects.
326. The BSEP AMR methodology does not predict loss of material due to general corrosion on the external surfaces of carbon steel structures and components exposed to operating temperatures greater than 212 °F.
327. The BSEP AMR methodology concluded that carbon steel exposed to dry air or gas exhibits no aging effects.

328. The two listed programs are substituted for AMP XI.M25. The water chemistry requirements are captured in the Water Chemistry Program and the NUREG-0313 and Generic Letter 88-01 inspection requirements are captured as augmented inspections in the ASME Section XI Inservice Inspection, IWB, IWC, and IWD Program.
329. The BSEP AMR methodology concluded that glass in a treated water environment has no aging effects.
330. Potential for fouling associated with failed coatings is managed by the Protective Coating Monitoring and Maintenance Program.
331. These components operate at temperatures substantially above ambient, such that moisture-related external corrosion is not expected.
332. The BSEP AMR methodology concluded that copper alloys in an indoor environment have no aging effects in the absence of sustained wetting.
333. Components in this group operate below the threshold temperature at which the SCC is predicted.
334. The BSEP AMR methodology concluded that the subject material in a lubricating oil environment has no aging effects.
335. Thermal insulation is credited in room cooler evaluations. Applicable insulation classes are glass fiber or calcium silicate, depending on temperature. No aging effects are predicted for these materials in an indoor environment.
336. Periodically inspected by the Preventive Maintenance Program.
337. Plant evaluation states that erosion/FAC not predicted on turbine supply piping based on high quality of steam.
338. Pertains to tubing and valves connected to pressure indicator instrumentation used on the Drywell personnel lock.
339. This line item represents the submerged components.
340. These components are in scope for spatial interaction/seismic support only. Flow restriction (M-3) function does not require aging management.
341. This line item pertains to instrument wells protected from the external environment and not susceptible to external corrosion.
342. The raw water internal environment for these components is relatively clean and, therefore, not expected to result in corrosion build-up sufficient to cause biofouling.
343. Since these components are not in contact with materials higher in the galvanic series, the BSEP AMR methodology does not predict galvanic corrosion for them.
344. This entry includes only the Diesel-Driven Fire Pump casing; the fuel supply line is addressed in the Fuel Oil System.
345. The BSEP AMR methodology does not predict crevice or pitting corrosion for galvanized carbon steel in an outdoor environment, but does predict loss of material due to aggressive chemical attack from the salt laden (sea-borne) air.
346. The BSEP AMR methodology predicts loss of material due to aggressive chemical attack on the external surfaces of unprotected carbon steel structures and components exposed to an outdoor environment.
347. Periodic testing of the diesel-driven fire pump ensures that the fuel supply line and associated components can perform their intended function.
348. BSEP requested and received approval to implement Risk-Informed ISI. In support of the submittal, evaluations of degradation mechanisms were performed; and cracking due to thermal and mechanical loadings was evaluated and dispositioned as not applicable. The risk associated with cracking due to SCC is bounded by those components selected for inservice inspection as part of the Risk-Informed ISI Program. Therefore, the current inspection methods as detailed in the ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD Program, supplemented by the Water Chemistry Program will manage cracking of small bore piping.
349. Applies to portion of drains system in proximity to safety related components.

3.4 AGING MANAGEMENT OF STEAM AND POWER CONVERSION SYSTEMS

3.4.1 INTRODUCTION

Section 3.4 provides the results of the aging management reviews (AMRs) for those components identified in Subsection 2.3.4, Steam and Power Conversion Systems, subject to aging management review. The systems or portions of systems are described in the indicated subsections.

1. Main Steam (MS) System (Subsection 2.3.4.1)

2. Extraction Steam System (As discussed in Subsection 2.3.4.2, this system contains no mechanical components/commodities requiring aging management review.)

3. Moisture Separator Reheater (MSR) Drains System and Reheat Steam System (As discussed in Subsection 2.3.4.3, this system contains no mechanical components/commodities requiring aging management review.)

4. Auxiliary Boiler (Subsection 2.3.4.4)

5. Feedwater (FW) System (Subsection 2.3.4.5)

6. Heater Drains (HD) and Miscellaneous Vents and Drains (MVD) (Subsection 2.3.4.6)

7. Condensate System (Subsection 2.3.4.7)

8. Turbine Building (TB) Sampling System (Subsection 2.3.4.8)

9. Main Condenser Gas Removal System (Subsection 2.3.4.9)

10. Turbine Electro-Hydraulic Control (EHC) System (In accordance with the discussion in Subsection 2.3.4.10, this system contains no mechanical components/commodities requiring aging management review.)

11. Turbine Generator Lube Oil (LO) System (As discussed in Subsection 2.3.4.11, this system contains no mechanical components/commodities requiring aging management review.)

12. Stator Cooling System (As discussed in Subsection 2.3.4.12, this system contains no mechanical components/commodities requiring aging management review.)

13. Hydrogen Seal Oil System (As discussed in Subsection 2.3.4.13, this system contains no mechanical components/commodities requiring aging management review.)

Table 3.4.1, Summary of Aging Management Evaluations in Chapter VIII of NUREG-1801 for Steam and Power Conversion Systems, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component/commodity groups in this Section. Table 3.4.1 uses the format of Table 1 described in Section 3.0 above.

3.4.1.1 Operating Experience

The AMR methodology applied at BSEP included use of operating experience (OE) to confirm the set of aging effects that had been predicted through material/environment evaluations. Plant-specific and industry OE through March 18, 2003 was identified and reviewed. OE subsequent to that date will be reviewed and applicable OE will be updated, as required, in conjunction with the amendment to the application required by 10 CFR 54.21(b). The OE review consisted of the following:

Site: BSEP site-specific OE has been captured by a review of the Action Tracking and the Maintenance Rule databases. This effort included a review of work management and leak log records, applicable correspondence (Licensee Event Reports, etc.), and Nuclear Assessment Section assessment records. The plant-specific OE review identified no additional unpredicted or unique aging effects requiring management.

Industry: Industry OE has been captured in NUREG-1801, “Generic Aging Lessons Learned (GALL),” and is the primary method for verifying that a complete set of potential aging effects is identified. An evaluation of industry OE published since the effective date of NUREG-1801 was performed to identify any additional aging effects requiring management. This was performed using Progress Energy internal OE review process which directs the review of OE and requires that it be screened and evaluated for site applicability. OE sources subject to review under this procedure include INPO and WANO items, NRC documents (Information Notices, Generic Letters, Notices of Violation, and staff reports), 10 CFR 21 reports, and vendor bulletins, as well as corporate internal OE information from Progress Energy nuclear sites. The industry OE review identified no additional unpredicted aging effects requiring management with the exception of erosion of certain piping segments in the Condensate System.

On-Going On-going review of plant-specific and industry operating experience is continuing to be performed in accordance with the Corrective Action Program and the Progress Energy internal OE review process.

3.4.2 RESULTS

The following tables summarize the results of the aging management review for systems in the Steam and Power Conversion Systems area.

These tables use the format of Table 2 described in Section 3.0 above.

3.4.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The materials from which specific components/commodities are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following subsections.

3.4.2.1.1 Main Steam (MS) System

Materials

The materials of construction for the MS System components are:

- Carbon Steel
- Stainless Steel

Environment

The MS System components are exposed to the following:

- Indoor Air
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following MS System aging effects require management:

- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the MS System components:

- Flow Accelerated Corrosion Program
- Water Chemistry Program

3.4.2.1.2 Auxiliary Boiler

Materials

The materials of construction for the Auxiliary Boiler components are:

- Carbon Steel

Environment

The Auxiliary Boiler components are exposed to the following:

- Indoor Air
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following Auxiliary Boiler aging effects require management:

- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the Auxiliary Boiler components:

- One-Time Inspection Program
- Systems Monitoring Program

3.4.2.1.3 Feedwater (FW) System

Materials

The materials of construction for the FW System components are:

- Carbon Steel
- Stainless Steel

Environment

The FW System components are exposed to the following:

- Indoor Air
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following FW System aging effects require management:

- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the FW System components:

- Flow Accelerated Corrosion Program
- One-Time Inspection Program
- Water Chemistry Program

3.4.2.1.4 Heater Drains (HD) and Miscellaneous Vents and Drains (MVD)

Materials

The materials of construction for the HD and MVD components are:

- Carbon Steel
- Stainless Steel

Environment

The HD and MVD components are exposed to the following:

- Indoor Air
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following HD and MVD aging effects require management:
- Cracking
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the HD and MVD components:
- Flow-Accelerated Corrosion Program
- One-Time Inspection Program
- Systems Monitoring Program
- Water Chemistry Program

3.4.2.1.5 Condensate System

Materials

The materials of construction for the Condensate System components are:
- Carbon Steel
- Grey Cast Iron
- Stainless Steel
- Copper Alloys
- Titanium

Environment

The Condensate System components are exposed to the following:
- Buried
- Indoor Air
- Outdoor Air
- Treated Water (Includes Steam)
- Raw Water

Aging Effects Requiring Management

The following Condensate System aging effects require management:
- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the Condensate System components:

- Aboveground Carbon Steel Tanks Program
- Buried Piping and Tanks Inspection Program
- One-Time Inspection Program
- Selective Leaching of Materials Program
- Systems Monitoring Program
- Water Chemistry Program

3.4.2.1.6 Turbine Building (TB) Sampling System

Materials

The materials of construction for the TB Sampling System components are:

- Stainless Steel

Environment

The TB Sampling System components are exposed to the following:

- Indoor Air
- Treated Water (Includes Steam)

Aging Effects Requiring Management

The following TB Sampling System aging effects require management:

- Cracking
- Loss of Material

Aging Management Programs

The following AMP manages the aging effects for the TB Sampling System components:

- Water Chemistry Program

3.4.2.1.7 Main Condenser Gas Removal System

Materials

The materials of construction for the Main Condenser Gas Removal System components are:

- Carbon Steel

Environment

The Main Condenser Gas Removal System components are exposed to the following:

- Indoor Air
- Treated Water

Aging Effects Requiring Management

The following Main Condenser Gas Removal System aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the Main Condenser Gas Removal System components:

- One-Time Inspection Program
- Systems Monitoring Program
- Water Chemistry Program

3.4.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 Provides the basis for identifying those programs that warrant further evaluation by the reviewer in the LRA. For the Steam and Power Conversion Systems, those programs are addressed in the following subsections.

3.4.2.2.1 Cumulative Fatigue Damage

Fatigue is a 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 4.3.

3.4.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

Loss of material for carbon and stainless steel components in Steam and Power Conversion Systems (except for Main Steam System components) is managed by the Water Chemistry Program and to verify the efficacy of that program an inspection of select components and susceptible locations in accordance with the One-Time Inspection Program will be implemented.

3.4.2.2.3 Local Loss of Material Due to General, Pitting, and Crevice Corrosion, Microbiologically Influenced Corrosion, and Biofouling

This item is applicable to PWR Auxiliary Feedwater Systems; it is not applicable to BSEP.

3.4.2.2.4 General Corrosion

Loss of material for carbon steel components, including closure bolting, in Steam and Power Conversion Systems due to general corrosion on external surfaces that are exposed to operating temperatures less than 212°F, is managed by the plant-specific Systems Monitoring Program. Management of aging effects/mechanisms associated with the Main Condensers is not applicable as the pressure boundary integrity of the Main Condensers is continuously confirmed through normal plant operation.

3.4.2.2.5 Loss of Material Due to General, Pitting, and Microbiologically Influenced Corrosion

3.4.2.2.5.1 PWR Auxiliary Feedwater System Lube Oil Coolers

This item is applicable to PWR Auxiliary Feedwater Systems; it is not applicable to BSEP.

3.4.2.2.5.2 Buried Components

Emergency condensate storage tanks in AFW Systems are not applicable at BSEP since AFW is a PWR system. Also, there are no underground condensate storage tanks at BSEP.

3.4.2.3 Time-Limited Aging Analysis

The Time-Limited Aging Analyses (TLAA) identified below are associated with the Steam and Power Conversion System components. The subsection of the application that contains the TLAA review results is indicated in parenthesis.

1. Fatigue (Section 4.3, Metal Fatigue)

3.4.3 CONCLUSIONS

The Steam and Power Conversion Systems components/commodities having aging effects requiring management have been evaluated, and aging management programs have been selected to manage the aging effects. A description of the aging management programs is provided in Appendix B, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging will be adequately managed so that there is reasonable assurance that the intended functions of Steam and Power Conversion Systems components/commodities will be maintained consistent with the current licensing basis during the period of extended operation.

TABLE 3.4.1 SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VIII OF NUREG-1801 FOR STEAM AND POWER CONVERSION SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-01	Piping and fittings in main feedwater line, steam line and auxiliary feedwater (AFW) piping (PWR only)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue of metal components is a TLAA. Further evaluation is documented in Subsection 3.4.2.2.1
3.4.1-02	Piping and fittings, valve bodies and bonnets, pump casings, tanks, tubes, tubesheets, channel head, and shell (except main steam system)	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	Consistent with NUREG-1801 with exceptions. Aging effects are managed by the combination of the Water Chemistry and One-Time Inspection Programs. Exceptions apply to the NUREG-1801 recommendations for Water Chemistry Program and One-Time Inspection Program implementation. Further evaluation is documented in Subsection 3.4.2.2.2.
3.4.1-03	PWR only				
3.4.1-04	PWR only				

TABLE 3.4.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VIII OF NUREG-1801 FOR STEAM AND POWER CONVERSION SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-05	External surface of carbon steel components	Loss of material due to general corrosion	Plant specific	Yes, plant specific	The plant-specific AMP used to manage the aging effect/mechanism is the Systems Monitoring Program. Further evaluation is documented in Subsection 3.4.2.2.4. Management of aging effects/mechanisms associated with the Main Condensers is not applicable as the pressure boundary integrity of the Main Condensers is continuously confirmed through normal plant operation.
3.4.1-06	Carbon steel piping and valve bodies	Wall thinning due to flow-accelerated corrosion	Flow-accelerated corrosion	No	Consistent with NUREG-1801 with exceptions. This group contains carbon steel components in a treated water environment. The FAC Program is credited for managing this aging effect/mechanism.
3.4.1-07	Carbon steel piping and valve bodies in main steam system	Loss of material due to pitting and crevice corrosion	Water chemistry	No	Consistent with NUREG-1801 with exceptions. The Water Chemistry Program is credited for managing these aging effects/mechanisms in the Main Steam System. Exceptions apply to the NUREG-1801 recommendations for Water Chemistry Program implementation. For the Auxiliary Boiler and Heat Tracing Systems (Table 3.3.2-9), the One Time Inspection Program (consistent with NUREG-1801 with exceptions) is credited for managing these aging effects/mechanisms. This item is aligned to the extent that the material, environment and aging effects for these two systems are the same as those in the main steam system. AMR Standard Note E considers this but allows for a different program. The line items for these two systems were aligned using Note E.

TABLE 3.4.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VIII OF NUREG-1801 FOR STEAM AND POWER CONVERSION SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-08	Closure bolting in high-pressure or high-temperature systems	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and/or SCC.	Bolting integrity	No	Not applicable. Non-Class 1 closure bolting is considered to be a subcomponent of the associated component. Steam and Power Conversion Systems do not use high-strength pressure boundary bolting. Bolting materials were not itemized as a separate component. Therefore, a bolting integrity program is not credited for aging management. The AMP credited for external general corrosion (Systems Monitoring Program) will also address bolting materials.
3.4.1-09	Heat exchangers and coolers/ condensers serviced by open-cycle cooling water	Loss of material due to general (carbon steel only), pitting, and crevice corrosion, MIC, and biofouling; buildup of deposit due to biofouling	Open-cycle cooling water system	No	Not applicable. Management of aging effects/mechanisms associated with the Main Condensers is not applicable as the Main Condensers pressure boundary integrity is continuously confirmed through normal plant operation. The Open-Cycle Cooling Water System Program was not credited in managing aging effects/mechanisms for the Main Condensers.
3.4.1-10	Heat exchangers and coolers/ condensers serviced by closed-cycle cooling water	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Closed-cycle cooling water system	No	Not applicable. There are no heat exchangers and coolers/condensers serviced by a closed-cycle cooling water system in Steam and Power Conversion Systems. The Closed-Cycle Cooling Water System Program was not credited for managing aging effects/mechanisms for this item.

TABLE 3.4.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VIII OF NUREG-1801 FOR STEAM AND POWER CONVERSION SYSTEMS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1-11	External surface of aboveground condensate storage tank	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Aboveground carbon steel tanks	No	Consistent with NUREG-1801. The Condensate Storage Tanks are constructed of carbon steel. The Aboveground Carbon Steel Tanks Program is credited for managing loss of material due to general corrosion for the external surfaces of the Condensate Storage Tanks.
3.4.1-12	External surface of buried condensate storage tank and AFW piping	Loss of material due to general, pitting, and crevice corrosion, and MIC	Buried piping and tanks surveillance or	No	Not applicable at BSEP. The external surfaces of the Condensate Storage Tanks are not buried. Also, AFW piping is associated with PWRs.
			Buried piping and tanks inspection	Yes, detection of aging effects and operating experience are to be further evaluated	Not applicable at BSEP. Further evaluation is documented in Subsection 3.4.2.2.5.2. The Condensate Storage Tanks are located above ground (see Item 3.4.1-11). The Condensate Storage Tanks buried supply piping is managed by the Buried Piping and Tanks Inspection Program.
3.4.1-13	PWR only				

TABLE 3.4.2-1 STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – MAIN STEAM (MS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Steam Lines to Main Turbine (Group B))	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to General Corrosion	Water Chemistry			H
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry	VIII.B2.1-a	3.4.1-07	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.B2.1-c	3.4.1-01	
	M-7	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to General Corrosion	Water Chemistry			H
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry	VIII.B2.1-a	3.4.1-07	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.B2.1-c	3.4.1-01	

TABLE 3.4.2-1 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – MAIN STEAM (MS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Steam Drains)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry	VIII.B2.1-a	3.4.1-07	D
				Loss of Material due to FAC	Flow-Accelerated Corrosion	VIII.B2.1-b	3.4.1-06	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.B2.1-c	3.4.1-01	
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry			F

TABLE 3.4.2-1 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – MAIN STEAM (MS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Steam Drains) (continued)	M-7	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry	VIII.B2.1-a	3.4.1-07	D
				Loss of Material due to FAC	Flow-Accelerated Corrosion	VIII.B2.1-b	3.4.1-06	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.B2.1-c	3.4.1-01	
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry			F

TABLE 3.4.2-1 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – MAIN STEAM (MS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Check, Control, Hand, Motor Operated, Safety Valves) (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to General Corrosion	Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.B2.1-c	3.4.1-01	
				Loss of Material due to FAC	Flow-Accelerated Corrosion	VIII.B2.2-a	3.4.1-06	B
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry	VIII.B2.2-b	3.4.1-07	B
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry			F

TABLE 3.4.2-1 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – MAIN STEAM (MS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Check, Control, Hand, Motor Operated, Safety Valves) (Body and Bonnet) (continued)	M-7	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to General Corrosion	Water Chemistry			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.B2.1-c	3.4.1-01	
				Loss of Material due to FAC	Flow-Accelerated Corrosion	VIII.B2.2-a	3.4.1-06	B
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry	VIII.B2.2-b	3.4.1-07	B
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry			F

TABLE 3.4.2-1 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – MAIN STEAM (MS) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 401
	M-7	Carbon Steel	Indoor Air (External)	None	None			J, 401
Non-Carbon Steel Components (External Surfaces)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 402
	M-7	Stainless Steel	Indoor Air (External)	None	None			J, 402

TABLE 3.4.2-2 STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – AUXILIARY BOILER

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Steam Drains)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	One-Time Inspection	VIII.B2.1-a	3.4.1-07	E
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.B2.1-c	3.4.1-01	
Valves (Check, Control, Hand, Motor Operated, Safety Valves) (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			H
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.B2.1-c	3.4.1-01	
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	One-Time Inspection	VIII.B2.2-b	3.4.1-07	E
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VIII.H.1-b	3.4.1-05	E

TABLE 3.4.2-3 STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FEEDWATER (FW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Main Feedwater Line (Pipe and Fittings (Group B or D))	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Loss of Material due to FAC	Flow-Accelerated Corrosion	VIII.D2.1-a	3.4.1-06	B
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.D2.1-b	3.4.1-02	B
				Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.D2.1-c	3.4.1-01	
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
Valves (Control, Check, and Hand Valves) (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)	VIII.D2.1-c	3.4.1-01	
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.D2.2-b	3.4.1-02	B

TABLE 3.4.2-3 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – FEEDWATER (FW) SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Control, Check, and Hand Valves) (Body and Bonnet) (continued)	M-1	Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 401
Non-Carbon Steel Components (External Surfaces)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 402

TABLE 3.4.2-4 STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – HEATER DRAINS (HD) AND MISCELLANEOUS VENTS AND DRAINS (MVD)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Lines to Feedwater Heaters)	M-4	Carbon Steel	Indoor Air (Internal)	Loss of Material due to General Corrosion	One-Time Inspection			G
Piping and Fittings (Steam Drains)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to FAC	Flow-Accelerated Corrosion	VIII.C.1-a	3.4.1-06	B
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.C.1-b	3.4.1-02	B
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F

TABLE 3.4.2-4 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – HEATER DRAINS (HD) AND MISCELLANEOUS VENTS AND DRAINS (MVD)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Steam Drains) (continued)	M-7	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to FAC	Flow-Accelerated Corrosion	VIII.C.1-a	3.4.1-06	B
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.C.1-b	3.4.1-02	B
		Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
Valves (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to FAC	Flow-Accelerated Corrosion	VIII.C.2-a	3.4.1-06	B
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.C.2-b	3.4.1-02	B

TABLE 3.4.2-4 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – HEATER DRAINS (HD) AND MISCELLANEOUS VENTS AND DRAINS (MVD)

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet) (continued)	M-7	Carbon Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Loss of Material due to FAC	Flow-Accelerated Corrosion	VIII.C.2-a	3.4.1-06	B
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.C.2-b	3.4.1-02	B
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	None	None			J, 401
	M-4	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VIII.H.1-b	3.4.1-05	E
	M-7	Carbon Steel	Indoor Air (External)	None	None			J, 401
Non-Carbon Steel Components (External Surfaces)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 402
	M-7	Stainless Steel	Indoor Air (External)	None	None			J, 402

TABLE 3.4.2-5 STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION - CONDENSATE SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Condensate System								
Condensate Lines (Piping and Fittings)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.E.1-B	3.4.1-02	B
		Stainless Steel	Indoor Air (Internal)	None	None			G, 402
			Treated Water (Internal)	Loss of Material due to Erosion	One-Time Inspection			H
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.E.4-a	3.4.1-02	D
Valves (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Galvanic Corrosion	Water Chemistry and One-Time Inspection			H
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.E.2-b	3.4.1-02	B

TABLE 3.4.2-5 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION - CONDENSATE SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Valves (Body and Bonnet)	M-1	Grey Cast Iron	Treated Water (Internal)	Loss of Material due to Selective Leaching	Selective Leaching of Materials			F
				Loss of Material due to Galvanic Corrosion Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
		Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.E.4-a	3.4.1-02	D
Condensate Storage (Tank)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.E.5-a	3.4.1-02	B
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VIII.H.1-b	3.4.1-05	E
			Outdoor Air (External)	Loss of Material due to General Corrosion	Aboveground Carbon Steel Tanks	VIII.E.5-c	3.4.1-11	A
				Loss of Material due to General Corrosion	Systems Monitoring			G

TABLE 3.4.2-5 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION - CONDENSATE SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring			J, 403
		Grey Cast Iron	Outdoor Air (External)	Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
				Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion	Systems Monitoring			J
		Stainless Steel	Buried (External)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion	Buried Piping and Tanks Inspection			G
			Indoor Air (External)	None	None			J, 402
			Outdoor Air (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Systems Monitoring			J
Condensate Demineralizer System								
Condensate Cleanup System (Piping and Fittings)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.E.6-a	3.4.1-02	B

TABLE 3.4.2-5 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION - CONDENSATE SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VIII.H.1-B	3.4.1-05	E
Condensate Makeup System								
Condensate Lines (Piping and Fittings)	M-1	Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.E.4-a	3.4.1-02	D
Valves (Body and Bonnet)	M-1	Grey Cast Iron	Treated Water (Internal)	Loss of Material due to Selective Leaching	Selective Leaching of Materials			F
				Loss of Material due to Galvanic Corrosion	Water Chemistry and One-Time Inspection			F
				Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection			F
		Stainless Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.E.4-a	3.4.1-02	D

TABLE 3.4.2-5 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION - CONDENSATE SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-Carbon Steel Components (External Surfaces)	M-1	Grey Cast Iron	Outdoor Air (External)	Loss of Material due to Selective Leaching	Selective Leaching of Materials			J
				Loss of Material due to Galvanic Corrosion Loss of Material due to General Corrosion	Systems Monitoring			J
		Stainless Steel	Indoor Air (External)	None	None			J, 402
			Outdoor Air (External)	Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Systems Monitoring			J
Main Condenser								
Condensate Coolers/ Condensers (Tubes)	M-1	Titanium	Raw Water (Internal)	None	None			F, 404
			Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion	Not Applicable			F, 404
	M-7	Titanium	Raw Water (Internal)	None	None			F, 404
			Treated Water (Includes Steam) (External)	Loss of Material due to Crevice Corrosion	Not Applicable			F, 404

TABLE 3.4.2-5 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION - CONDENSATE SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Condensate Coolers/ Condensers (Tubesheet)	M-1	Copper Alloys	Raw Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion Loss of Material due to Selective Leaching	Not Applicable			F, 404
			Treated Water (Internal)	Loss of Material due to Selective Leaching	Not Applicable			F, 404
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Not Applicable			F, 404
	M-7	Copper Alloys	Raw Water (External)	Loss of Material due to Crevice Corrosion Loss of Material due to MIC Loss of Material due to Pitting Corrosion Loss of Material due to Selective Leaching	Not Applicable			F, 404
			Treated Water (Internal)	Loss of Material due to Selective Leaching	Not Applicable			F, 404
				Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Not Applicable			F, 404

TABLE 3.4.2-5 (continued) STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION - CONDENSATE SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Condensate Coolers/ Condensers (Shell)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Not Applicable	VIII.E.4-A	3.4.1-02	E, 404
	M-7	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Not Applicable	VIII.E.4-a	3.4.1-02	E, 404
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Not Applicable	VIII.H.1-b	3.4.1-05	E, 404
	M-7	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Not Applicable	VIII.H.1-b	3.4.1-05	E, 404

TABLE 3.4.2-6 STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – TURBINE BUILDING (TB) SAMPLING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Piping and Fittings (Steam Drains)	M-1	Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry			F
	M-7	Stainless Steel	Treated Water (Includes Steam) (Internal)	Cracking due to Thermal Fatigue	TLAA, evaluated in accordance with 10 CFR 54.21(c)			
				Cracking due to SCC Loss of Material due to Crevice Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry			F
Non-Carbon Steel Components (External Surfaces)	M-1	Stainless Steel	Indoor Air (External)	None	None			J, 402
	M-7	Stainless Steel	Indoor Air (External)	None	None			J, 402

TABLE 3.4.2-7 STEAM AND POWER CONVERSION SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – MAIN CONDENSER GAS REMOVAL SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Condensate Lines (Piping and Fittings)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.E.1-b	3.4.1-02	B
Valves (Body and Bonnet)	M-1	Carbon Steel	Treated Water (Internal)	Loss of Material due to Crevice Corrosion Loss of Material due to General Corrosion Loss of Material due to Pitting Corrosion	Water Chemistry and One-Time Inspection	VIII.E.2-b	3.4.1-02	B
Carbon Steel Components (External Surfaces)	M-1	Carbon Steel	Indoor Air (External)	Loss of Material due to General Corrosion	Systems Monitoring	VIII.H.1-b	3.4.1-05	E

Notes for Tables 3.4.2-1 through 3.4.2-7:

Generic Notes:

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E. Consistent with NUREG-1801 for material, environment, and aging effect, but a different AMP is credited.
F. Material not in NUREG-1801 for this component.
G. Environment not in NUREG-1801 for this component and material.
H. Aging effect not in NUREG 1801 for this component, material, and environment combination.
I. Aging effect in NUREG-1801 for this component, material, and environment combination is not applicable.
J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific Notes:

401. The BSEP AMR methodology concluded that external surfaces of carbon steel components at a process temperature above 212°F, in an Indoor Air environment have no aging effects.
402. The BSEP AMR methodology concluded that the subject material in an Indoor Air environment, and the absence of moisture, has no aging effects.
403. Line represents components constructed of cast iron.
404. Aging management of the Main Condensers is not based on analysis of materials, environments and aging effects. Materials, environments and aging effects were evaluated, but Main Condenser integrity required to perform post-accident intended functions (holdup and plateout of MSIV leakage) is continuously confirmed by normal plant operation. No traditional aging management program is required. The Main Condensers must perform a significant pressure boundary function (maintain vacuum) to allow continued plant operation. The post-accident intended function of the Main Condensers is to provide a holdup volume and plateout surface for MSIV leakage. This intended function does not require the Main Condensers to be leak-tight, with the post-accident conditions in the Main Condensers essentially atmospheric. Under post-accident conditions, there will be no challenge to the pressure boundary integrity of the Main Condensers. Since normal plant operation assures adequate Main Condenser pressure boundary integrity, the post-accident intended function to provide pressure boundary and holdup volume and plateout surface is assured.

3.5 AGING MANAGEMENT OF CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

3.5.1 INTRODUCTION

Section 3.5 provides the results of the aging management reviews (AMRs) for those components identified in Subsection 2.4, Scoping and Screening Results - Structures, subject to aging management review. The systems or portions of systems are described in the indicated subsections.

1. Containment (Subsection 2.4.1)

2. Other Class I and In-Scope Structures:

    Intake and Discharge Canals (Subsection 2.4.2.1)

    Refueling System (Subsection 2.4.2.2)

    Switchyard and Transformer Yard Structures (Subsection 2.4.2.3)

    Monorail Hoists (Subsection 2.4.2.4)

    Bridge Cranes (Subsection 2.4.2.5)

    Gantry Cranes (Subsection 2.4.2.6)

    Service Water Intake Structure (Subsection 2.4.2.7)

    Reactor Building (Subsection 2.4.2.8)

    Augmented Off-Gas Building (Subsection 2.4.2.9)

    Diesel Generator Building (Subsection 2.4.2.10)

    Control Building (Subsection 2.4.2.11)

    Turbine Building (Subsection 2.4.2.12)

    Radwaste Building (Subsection 2.4.2.13)

    Water Treatment Building (Subsection 2.4.2.14)

    Miscellaneous Structures and Out-Buildings (Subsection 2.4.2.15)

Table 3.5.1, Summary of Aging Management Evaluations in Chapter II and III of NUREG-1801 for Containments, Structures, and Component Supports, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component/ commodity groups in this Section. Table 3.5.1 uses the format of Table 1 described in Section 3.0 above.

3.5.1.1 Operating Experience

The AMR methodology applied at BSEP included use of operating experience (OE) to confirm the set of aging effects that had been identified through material/environment evaluations. Plant-specific and industry OE through March 18, 2003 was identified and reviewed. OE subsequent to that date will be reviewed and applicable OE will be updated, as required, in conjunction with the amendment to the application required by 10 CFR 54.21(b). The OE review consisted of the following:

Site: BSEP site-specific OE has been captured by a review of the Action Tracking and the Maintenance Rule databases. This effort included a review of work management and leak log records, applicable correspondence (Licensee Event Reports, etc.), and Nuclear Assessment Section assessment records. The plant-specific OE review identified no additional unpredicted or unique aging effects requiring management.

Industry: Industry OE has been captured in NUREG-1801, “Generic Aging Lessons Learned (GALL),” and is the primary method for verifying that a complete set of potential aging effects is identified. An evaluation of industry OE published since the effective date of NUREG-1801 was performed to identify any additional aging effects requiring management. This was performed using Progress Energy internal OE review process which directs the review of OE and requires that it be screened and evaluated for site applicability. OE sources subject to review under this procedure include INPO and WANO items, NRC documents (Information Notices, Generic Letters, Notices of Violation, and staff reports), 10 CFR 21 reports, and vendor bulletins, as well as corporate internal OE information from Progress Energy nuclear sites. The industry OE review identified no additional unpredicted aging effects requiring management.

On-Going On-going review of plant-specific and industry operating experience is continuing to be performed in accordance with the Corrective Action Program and the Progress Energy internal OE review process.

3.5.1.2 Comparison of Primary Containment Structure to NUREG-1801

Correlation of the PCS with NUREG-1801 is unique within the industry because the BSEP Primary Containment is the only BWR Mark I reinforced concrete containment in the United States. Chapter II of the NUREG-1801 provides guidance for a BWR Mark I steel containment and for a BWR Mark II concrete containment; however, no guidance is provided for a BWR Mark I reinforced concrete containment.

The BSEP containment structure is essentially the same as the NUREG-1801 BWR Mark I steel containment except that the Brunswick containment is a steel-lined reinforced concrete structure rather than a free standing steel containment. This difference means the BSEP containment structure looks like BWR Mark I steel containment, with a Drywell and Torus, but is fabricated from reinforced concrete, like a BWR Mark II concrete containment. Refer to Figure 3.5-1. The materials, environments, and aging effects/mechanisms, described by the NUREG-1801 for a Mark II concrete containment are essentially the same as those identified by the BSEP aging management review methodology for the BSEP concrete containment. The NUREG-1801 description of concrete structures and/or components for Mark II concrete containments is sufficiently generic that the concrete portions of the BSEP containment may be compared with the concrete portions of the NUREG-1801 Mark II concrete containment; and this has been done in the LRA Tables. Similarly, the steel elements for the BSEP containment may be compared with the steel elements described for the NUREG-1801 BWR Mark I Steel Containment; and this has been done. Also, the BSEP containment common components have been compared with the BWR Containment Common Components described in NUREG-1801 Chapter II, Section B4.

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 – Summary of Aging Management Evaluation – Primary Containment

Table 3.5.2-2 Containments, Structures and Component Supports – Summary of Aging Management Evaluation – Intake and Discharge Canals

Table 3.5.2-3 Containments, Structures and Component Supports – Summary of Aging Management Evaluation – Refueling System

Table 3.5.2-4 Containments, Structures and Component Supports – Summary of Aging Management Evaluation – Switchyard and Transformer Yard Structures

These tables use the format of Table 2 described in Section 3.0 above.

3.5.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The materials from which specific components/commodities are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above structures in the following subsections.

3.5.2.1.1 Primary Containment

Materials

The materials of construction for the Primary Containment components are:

- Carbon Steel
- Galvanized Carbon Steel
- Stainless Steel
- Lubrite
- Concrete
- Elastomers
- Hydrous Calcium Silicate (Insulation)

Environment

The Primary Containment components are exposed to the following:

- Containment Air
- Torus Air
- Protected from Weather
- Treated Water
- Raw Water
- Embedded/Encased

Aging Effects Requiring Management

The following Primary Containment aging effects require management:

- Loss of Material
- Loss of Mechanical Function
- Reduction In Concrete Anchor Capacity due to Local Concrete Degradation
- Cracking
- Change In Material Properties
- Loss of Leak Tightness in Closed Condition

Aging Management Programs

The following AMPs manage the aging effects for the Primary Containment components:

- Structures Monitoring Program
- ASME Section XI, Subsection IWE Program
- ASME Section XI, Subsection IWL Program
- ASME Section XI, Subsection IWF Program
- 10 CFR Part 50, Appendix J Program

3.5.2.1.2 Intake and Discharge Canals

Materials

The materials of construction for the Intake and Discharge Canals components are:

- Earth
- Carbon Steel

Environment

The Intake and Discharge Canals components are exposed to the following:

- Exposed to Weather
- Raw Water (Intake Water)
- Below Grade/Submerged

Aging Effects Requiring Management

The following Intake and Discharge Canals aging effects require management:

- Loss of Form (Intake Canal)
- Loss of Material (Sheet Piles)

Aging Management Programs

The following AMP manages the aging effects for the Intake and Discharge Canals components:

- Structures Monitoring Program

3.5.2.1.3 Refueling System

Materials

The materials of construction for the Refueling System components are:

- Carbon Steel
- Aluminum (Fuel Prep Machine only)

Environment

The Refueling System components are exposed to the following:

- Protected from Weather
- Treated Water (Fuel Prep Machine only)

Aging Effects Requiring Management

The following Refueling System aging effects require management:

- Loss of Material

Aging Management Programs

The following AMPs manage the aging effects for the Refueling System components:

- Structures Monitoring Program
- Water Chemistry Program

3.5.2.1.4 Switchyard and Transformer Yard Structures

Materials

The materials of construction for the Switchyard and Transformer Yard Structures components are:

- Carbon Steel
- Galvanized Carbon Steel
- Concrete

Environment

The Switchyard and Transformer Yard Structures components are exposed to the following:

- Protected from Weather
- Exposed to Weather
- Below Grade/Submerged
- Embedded/Encased
- Driven in Undisturbed Soil

Aging Effects Requiring Management

The following Switchyard and Transformer Yard Structures aging effects require management:

- Loss of Material
- Reduction in Concrete Anchor Capacity due to Local Concrete Degradation

Aging Management Programs

The following AMP manages the aging effects for the Switchyard and Transformer Yard Structures components:

- Structures Monitoring Program

3.5.2.1.5 Monorail Hoists

Monorail Hoists are considered to be structural steel. Therefore, the aging management review of monorail hoists is performed as part of the civil commodity group of structural steel within a specific structure. The TLAA associated with fatigue of Monorail Hoists is addressed in Subsection 4.7.3.

3.5.2.1.6 Bridge Cranes

Materials

The materials of construction for the Bridge Cranes components are:

- Carbon Steel

Environment

The Bridge Cranes components are exposed to the following:

- Protected from Weather

Aging Effects Requiring Management

The following Bridge Cranes aging effects require management:

- Loss of Material (Includes Wear)

Aging Management Programs

The following AMP manages the aging effects for the Bridge Cranes components:

- Inspection of Overhead Heavy Load and Light Load Handling Systems

3.5.2.1.7 Gantry Cranes

Materials

The materials of construction for the Gantry Cranes components are:

- Carbon Steel

Environment

The Gantry Cranes components are exposed to the following:

- Exposed to Weather

Aging Effects Requiring Management

The following Gantry Cranes aging effects require management:

- Loss of Material (Includes Wear)

Aging Management Programs

The following AMP manages the aging effects for the Gantry Cranes components:

- Inspection of Overhead Heavy Load and Light Load Handling Systems

3.5.2.1.8 Service Water Intake Structure

Materials

The materials of construction for the Service Water Intake Structure components are:

- Carbon Steel
- Galvanized Carbon Steel
- Stainless Steel
- Aluminum
- Concrete
- Masonry Block
- Fire Proofing Materials
- Penetration Sealants
- Elastomers

Environment

The Service Water Intake Structure components are exposed to the following:

- Protected from Weather
- Exposed to Weather
- Below Grade/Submerged
- Embedded/Encased
- Raw Water (Intake Water)

Aging Effects Requiring Management

The following Service Water Intake Structure aging effects require management:

- Loss of Material (Includes Wear)
- Loss of Mechanical Function
- Change in Material Properties
- Reduction in Concrete Anchor Capacity due to Local Concrete Degradation
- Cracking
- Cracking, Delamination and Separation

Aging Management Programs

The following AMPs manage the aging effects for the Service Water Intake Structure components:

- Structures Monitoring Program
- Masonry Wall Program
- ASME Section XI, Subsection IWF Program
- Fire Protection Program

3.5.2.1.9 Reactor Building

Materials

The materials of construction for the Reactor Building components are:

- Carbon Steel
- Galvanized Carbon Steel
- Stainless Steel
- Boral
- Aluminum
- Lubrite
- Concrete
- Masonry Block
- Fire Proofing Materials
- Penetration Sealants
- Elastomers

Environment

The Reactor Building components are exposed to the following:

- Protected from Weather
- Exposed to Weather
- Below Grade/Submerged
- Embedded/Encased
- Treated Water

Aging Effects Requiring Management

The following Reactor Building aging effects require management:

- Loss of Material
- Loss of Mechanical Function
- Reduction In Concrete Anchor Capacity due to Local Concrete Degradation

- Change in Material Properties
- Cracking
- Cracking, Delamination and Separation

Aging Management Programs

The following AMPs manage the aging effects for the Reactor Building components:

- Structures Monitoring Program
- Masonry Wall Program
- ASME Section XI, Subsection IWF Program
- Fire Protection Program
- Water Chemistry Program
- Fuel Pool Girder Tendon Monitoring Program

3.5.2.1.10 Augmented Off-Gas Building

Materials

The materials of construction for the Augmented Off-Gas Building components are:

- Carbon Steel
- Galvanized Carbon Steel
- Lubrite
- Concrete
- Masonry Block
- Penetration Sealants

Environment

The Augmented Off-Gas Building components are exposed to the following:

- Protected from Weather
- Exposed to Weather
- Below Grade/Submerged
- Embedded/Encased

Aging Effects Requiring Management

The following Augmented Off-Gas Building aging effects require management:

- Loss of Material
- Reduction in Concrete Anchor Capacity due to Local Concrete Degradation
- Cracking
- Cracking, Delamination and Separation

Aging Management Programs

The following AMPs manage the aging effects for the Augmented Off-Gas Building components:

- Structures Monitoring Program
- Masonry Wall Program
- Fire Protection Program

3.5.2.1.11 Diesel Generator Building

Materials

The materials of construction for the Diesel Generator Building components are:

- Carbon Steel
- Galvanized Carbon Steel
- Aluminum
- Concrete
- Masonry Block
- Fire Proofing Materials
- Penetration Sealants
- Elastomers

Environment

The Diesel Generator Building components are exposed to the following:

- Protected from Weather
- Exposed to Weather
- Below Grade/Submerged
- Embedded/Encased

Aging Effects Requiring Management

The following Diesel Generator Building aging effects require management:

- Loss of Material
- Loss of Mechanical Function
- Reduction in Concrete Anchor Capacity due to Local Concrete Degradation
- Change in Material Properties
- Cracking
- Cracking, Delamination and Separation

Aging Management Programs

The following AMPs manage the aging effects for the Diesel Generator Building components:

- Structures Monitoring Program
- Masonry Wall Program
- ASME Section XI, Subsection IWF Program
- Fire Protection Program

3.5.2.1.12 Control Building

Materials

The materials of construction for the Control Building components are:

- Carbon Steel
- Galvanized Carbon Steel
- Concrete
- Masonry Block
- Fire Proofing Materials
- Penetration Sealants
- Elastomers
- Incombustible Mineral Fiber (control room acoustical ceiling tiles)

Environment

The Control Building components are exposed to the following:

- Protected from Weather
- Exposed to Weather
- Below Grade/Submerged
- Embedded/Encased

Aging Effects Requiring Management

The following Control Building aging effects require management:

- Loss of Material
- Reduction in Concrete Anchor Capacity due to Local Concrete Degradation
- Cracking
- Cracking, Delamination and Separation
- Change in Material Properties

Aging Management Programs

The following AMPs manage the aging effects for the Control Building components:

- Structures Monitoring Program
- Masonry Wall Program
- Fire Protection Program

3.5.2.1.13 Turbine Building

Materials

The materials of construction for the Turbine Building components are:

- Carbon Steel
- Galvanized Carbon Steel
- Concrete
- Masonry Block
- Fire Proofing Materials
- Penetration Sealants
- Elastomers

Environment

The Turbine Building components are exposed to the following:

- Protected from Weather
- Exposed to Weather
- Below Grade/Submerged
- Embedded/Encased
- Raw Water (Intake Water)

Aging Effects Requiring Management

The following Turbine Building aging effects require management:

- Loss of Material
- Reduction in Concrete Anchor Capacity due to Local Concrete Degradation
- Cracking
- Cracking, Delamination and Separation
- Change in Material Properties

Aging Management Programs

The following AMPs manage the aging effects for the Turbine Building components:

- Structures Monitoring Program
- Masonry Wall Program
- Fire Protection Program

3.5.2.1.14 Radwaste Building

Materials

The materials of construction for the Radwaste Building components are:

- Carbon Steel
- Galvanized Carbon Steel
- Concrete
- Elastomers

Environment

The Radwaste Building components are exposed to the following:

- Protected from Weather
- Exposed to Weather
- Below Grade/Submerged
- Embedded/Encased

Aging Effects Requiring Management

The following Radwaste Building aging effects require management:

- Loss of Material
- Reduction in Concrete Anchor Capacity due to Local Concrete Degradation
- Change in Material Properties
- Cracking

Aging Management Programs

The following AMP manages the aging effects for the Radwaste Building components:

- Structures Monitoring Program

3.5.2.1.15 Water Treatment Building

Materials

The materials of construction for the Water Treatment Building components are:

- Carbon Steel
- Galvanized Carbon Steel
- Concrete

Environment

The Water Treatment Building components are exposed to the following:

- Protected from Weather
- Exposed to Weather
- Below Grade/Submerged
- Embedded/Encased

Aging Effects Requiring Management

The following Water Treatment Building aging effects require management:

- Loss of Material
- Reduction in Concrete Anchor Capacity due to Local Concrete Degradation

Aging Management Programs

The following AMP manages the aging effects for the Water Treatment Building components:

- Structures Monitoring Program
- Fire Protection Program

3.5.2.1.16 Miscellaneous Structures and Out-Buildings

Materials

The materials of construction for the Miscellaneous Structures and Out-Buildings components are:

- Carbon Steel
- Galvanized Carbon Steel
- Concrete

Environment

The Miscellaneous Structures and Out-Buildings components are exposed to the following:

- Protected from Weather
- Exposed to Weather
- Below Grade/Submerged
- Embedded/Encased
- Driven in Undisturbed Soil

Aging Effects Requiring Management

The following Miscellaneous Structures and Out-Buildings aging effects require management:

- Loss of Material

Aging Management Programs

The following AMP manages the aging effects for the Miscellaneous Structures and Out-Buildings components:

- Structures Monitoring Program

3.5.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the LRA. For the Containments, Structures, and Component Supports, those programs are addressed in the following subsections.

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Aging of Inaccessible Concrete

The aging mechanisms of leaching of calcium hydroxide, aggressive chemical attack, and corrosion of embedded steel are not significant for the concrete components of the Primary Containment Structure. Refer to Figure 3.5-1. The BSEP Primary Containment is completely contained within the Reactor Building; therefore, it is not subject to aging effects associated with a below-grade, exterior environment. The Primary Containment concrete is not exposed to an aggressive environment and has been designed in accordance with ACI 318, with a low water/cement ratio and entrained air between 3 and 6%. Therefore, the aging mechanism of leaching of calcium hydroxide, which becomes significant only if the concrete is subject to flowing water, is not applicable. Also, aggressive chemical attack and corrosion of embedded steel are not applicable because the concrete is not exposed to aggressive chemicals.

3.5.2.2.1.2 Cracking, Distortion, and Increase in Component Stress Level Due to Settlement; Reduction of Foundation Strength Due to Erosion of Porous Concrete Subfoundations, if Not Covered by Structures Monitoring Program

Settlement was monitored during construction of BSEP, and the predicted settlement values were found to be consistent with that actually experienced. Plant engineers monitor for the effects of differential settlement during inspections of structures under the Structures Monitoring Program. A review of plant operating history has not identified any settlement issues.

BSEP structures do not have porous concrete subfoundations, and BSEP does not employ a dewatering system. Furthermore, the Primary Containment concrete is not in contact with the soil or groundwater. Therefore, reduction of foundation strength due to erosion of porous concrete is not an applicable aging effect.

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature

Elevated temperatures above the limits specified in NUREG-1801 are not applicable for concrete structures and components outside the Primary Containment. Inside the Primary Containment Structure, the bulk average temperature is less than 150°F; however, data for the confined, upper elevations of the Primary Containment have identified a maximum average temperature of 194°F. Based on an evaluation of Drywell temperatures, the contact temperature at the inside face of the concrete (Drywell side) is approximately 175°F and the contact temperature at the outside face of the concrete (Reactor Building side) is approximately 107°F. Because the elevated temperatures are localized to the confined upper elevation of the Drywell and the actual concrete temperatures are on a gradient through the Drywell wall, the upper elevation of the Drywell is considered a local rather than a general area.

Therefore, the containment concrete elements are exposed to temperatures consistent with the guidance provided in NUREG-1801, which defines elevated temperatures as greater than 150°F general and 200°F local; and the primary containment concrete is not subject to degradation due to elevated temperature.

3.5.2.2.1.4 Loss of Material Due to Corrosion in Inaccessible Areas of Steel Containment Shell or Liner Plate

Loss of material due to corrosion in inaccessible areas (embedded containment steel shell or liner), is not significant because:

- The Primary Containment concrete structure was designed to ACI 318 and was constructed in accordance with ACI 301. The low water-cement ratio and an air entrainment between 3 and 6% provides a dense concrete with a low permeability, which meets the intent of ACI 201.2R.

- The concrete is monitored by the Structures Monitoring Program to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment liner.

- The moisture barrier, at the junction where the shell or liner becomes embedded, is subject to aging management activities in accordance with IWE requirements.

- The above moisture barrier at the Drywell liner and concrete containment floor interface has been designed to direct water away from the Drywell liner. The containment concrete floor is sloped away from the Drywell liner for drainage purposes. Periodic inspections of the concrete floor surface condition performed in accordance with the Structures Monitoring Program will validate the continued absence of corrosion for the inaccessible portions of the Drywell liner.

3.5.2.2.1.5 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature

The BSEP Primary Containment Structure is constructed of reinforced concrete. There are no prestressed tendons associated with the Primary Containment Structure design. Therefore, the aging effect, loss of prestress, is not applicable to the BSEP Primary Containment Structure.

3.5.2.2.1.6 Cumulative Fatigue Damage

This NUREG-1801 discussion involves metal fatigue of steel elements, such as, containment penetration sleeves and bellows, Torus plate, vent lines, vent line bellows, vent header, and downcomers. The BSEP containment design includes carbon steel penetrations, containment liner plate, vent lines, vent header and downcomers, and stainless steel vent line bellows. The containment penetrations do not employ bellows. Of the steel components, only the Torus vent header and downcomers have been analyzed for fatigue. These analyses are TLAAs; refer to Section 4.6.

3.5.2.2.1.7 Cracking Due to Cyclic Loading and SCC

This NUREG-1801 discussion involves cracking due to cyclic loading and SCC of carbon steel, stainless steel, and dissimilar metal welds in containment penetration sleeves and bellows, and in vent line bellows, vent headers, and downcomers. BSEP penetrations do not use expansion bellows, and penetration sleeves are fabricated from carbon steel. However, some penetrations incorporate stainless steel components, which require dissimilar metal welds. The vent line bellows are fabricated from stainless steel, and the vent header and downcomers are fabricated from carbon steel.

SCC is not an applicable aging effect for these components, because (1) carbon steel components are not susceptible to SCC, and (2) to be susceptible to SCC, stainless steel must be subject to both high temperature (>140°F) and an aggressive chemical environment. Components fabricated from stainless steel are not subject to an aggressive chemical environment.

Cracking of metal components owing to cyclic loads is a potential aging effect. However, the AMR, as supported by operating experience, concluded that cyclic loading from plant heatups and cooldowns, containment testing, and from system vibration was very low or limited in numbers of cycles; and, therefore, additional methods of detecting postulated cracking were not warranted. Note that the cyclic loading of the vent header and downcomers has been analyzed as a TLAA; refer to Subsection 3.5.2.2.1.6 above.

For the steel elements of containment that are part of the IWE pressure boundary; both the ASME Section XI, Subsection IWE and the 10 CFR Part 50, Appendix J Programs are used to monitor for degradation. However, the vent line bellows are inaccessible, and only the accessible surface areas of the assembly are subject to visual examination. A review of BSEP OE indicates that cracking has not been a concern for steel containment pressure boundary components.

Based on the above discussion, potential cracking of steel containment components is not expected, and use of the combination of the ASME Section XI, Subsection IWE Program and the 10 CFR Part 50, Appendix J Program, as recommended by NUREG-1801, will adequately assure the detection of cracking should it occur.

3.5.2.2.2 Class 1 Structures

3.5.2.2.2.1 Aging of Structures Not Covered by Structures Monitoring Program

NUREG-1801 recommends further evaluation of certain structure/aging effect combinations if they are not covered by the structures monitoring program. These are discussed in the following paragraphs.

Aging effects associated with freeze/thaw; leaching of calcium hydroxide; reaction with aggregates; corrosion of embedded steel; and aggressive chemical attack of concrete are not applicable as discussed in the plant-specific notes associated with Tables 3.5.2-1 through 3.5.2-15. Nevertheless, the Structures Monitoring Program is credited for aging management of these effects/mechanisms for the affected structures, in accordance with the current NRC position. Corrosion of structural steel components is addressed by the Structures Monitoring Program.

Aging effects associated with NUREG-1801, Volume 2, item III.A4.2-b, involve Lubrite slide bearing plates. The plates provide a low friction barrier between the equipment and their support structures. Based on a review of industry operating experience, and after 20 years of service at BSEP, there has been no adverse experience data recorded for the Lubrite sliding surfaces for applications both inside and outside containment. Based on the low cycle service required, it is concluded the Lubrite bearing plates will continue to perform their intended function for the period of extended operation.

3.5.2.2.2.2 Aging Management of Inaccessible Areas

The Service Water Intake Structure is the only structure with concrete elements subject to aggressive ground water. The structure is located adjacent to the Intake Canal; therefore, the environmental parameters of the intake water have been applied to the below grade portions of the concrete. Groundwater monitoring is performed periodically to validate that the below-grade environment is not aggressive for in-scope structures other than the Service Water Intake Structure.

Examination of representative samples of below-grade concrete, when excavated for any reason, will be included as part of the Structures Monitoring Program, which will be used to manage aging due to aggressive chemical attack and corrosion of embedded steel.

3.5.2.2.3 Component Supports

3.5.2.2.3.1 Aging of Supports Not Covered by Structures Monitoring Program.

NUREG-1801 recommends further evaluation of certain component support/aging effect combinations if they are not covered by the structures monitoring program. Degradation of these components/commodities at BSEP is managed by the Structures Monitoring Program.

3.5.2.2.3.2 Cumulative Fatigue Damage Due to Cyclic Loading

There are no fatigue analyses applicable to component supports in the CLB; therefore, cumulative fatigue damage of component supports is not a TLAA as defined in 10 CFR 54.3.

3.5.2.3 Time-Limited Aging Analysis

The Time-Limited Aging Analyses (TLAA) identified below are associated with the Containments, Structures, and Component Support components. The subsection of the application that contains the TLAA review results is indicated in parenthesis.

1. Torus Downcomer/Vent Header and Related Piping Fatigue (Section 4.6, Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analyses)
2. Crane, Refueling Platform, and Hoist Fatigue (Subsection 4.7.3)
3. Fuel Pool Girder Tendon Loss of Prestress (Subsection 4.7.2)
4. Torus Component Corrosion Allowance (Subsection 4.7.4)

3.5.3 CONCLUSIONS

The Containments, Structures, and Component Support components/commodities having aging effects requiring management have been evaluated, and aging management programs have been selected to manage the aging effects. A description of the aging management programs is provided in Appendix B, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging will be adequately managed so that there is reasonable assurance that the intended functions of Containments, Structures, and Component Support components/ commodities will be maintained consistent with the current licensing basis during the period of extended operation.

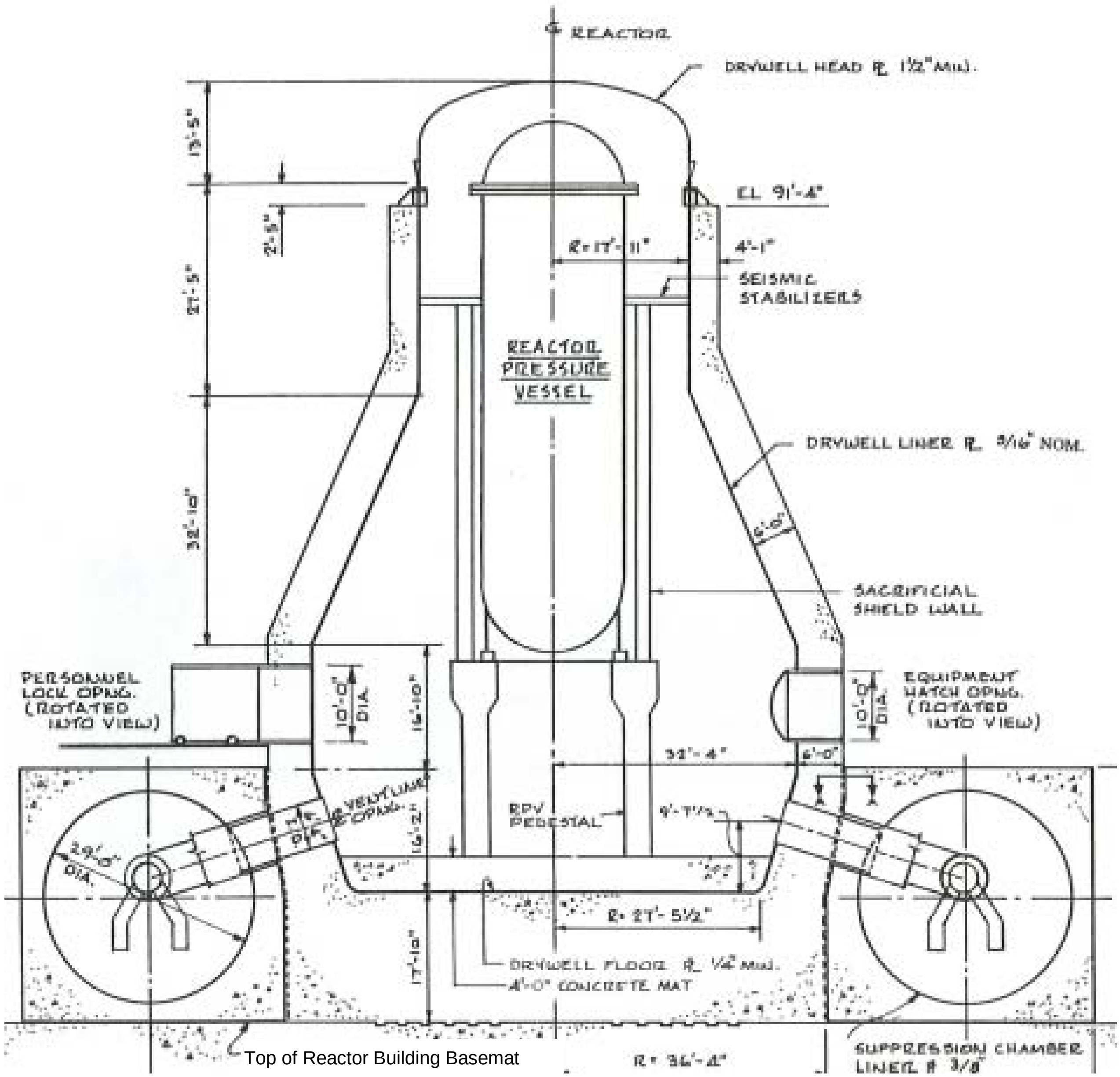


FIGURE 3.5-1 PRIMARY CONTAINMENT STRUCTURE

TABLE 3.5.1 SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTERS II AND III OF NUREG-1801 FOR CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
Common Components of All Types of PWR and BWR Containment					
3.5.1-01	Penetration sleeves, penetration bellows, and dissimilar metal welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	This item is not applicable to BSEP. In accordance with NUREG-1801, no aging management is required, because no CLB fatigue analysis exists. Refer to Subsection 3.5.2.2.1.6 for further information.
3.5.1-02	Penetration sleeves, bellows, and dissimilar metal welds	Cracking due to cyclic loading; crack initiation and growth due to SCC	Containment inservice inspection (ISI) and containment leak rate test	Yes, detection of aging effects is to be evaluated	The ASME Section XI, Subsection IWE Program and the 10 CFR Part 50, Appendix J Program are credited. Further evaluation is documented in Subsection 3.5.2.2.1.7.
3.5.1-03	Penetration sleeves, penetration bellows, and dissimilar metal welds	Loss of material due to corrosion	Containment ISI and Containment leak rate test	No	Consistent with NUREG-1801. Aging effects are managed by the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J Programs.
3.5.1-04	Personnel airlock and equipment hatch	Loss of material due to corrosion	Containment ISI and containment leak rate test	No	Consistent with NUREG-1801. Aging effects are managed by the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J Programs.

TABLE 3.5.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTERS II AND III OF NUREG-1801 FOR CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-05	Personnel airlock and equipment hatch	Loss of leak tightness in closed position due to mechanical wear of locks, hinges, and closure mechanisms	Containment leak rate test and plant technical specifications	No	Consistent with NUREG-1801. Aging effects are managed by the 10 CFR Part 50, Appendix J Program and BSEP Unit 1 and 2 Technical Specifications for Containment Systems.
3.5.1-06	Seals, gaskets, and moisture barriers	Loss of sealant and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers	Containment ISI and containment leak rate test	No	Consistent with NUREG-1801. Aging effects are managed by the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J Programs.
PWR Concrete (Reinforced and Prestressed) and Steel Containment BWR Concrete (Mark II and III) and Steel (Mark I, II, and III) Containment					
3.5.1-07	Concrete elements: foundation, dome, and wall	Aging of accessible and inaccessible concrete areas due to leaching of calcium hydroxide, aggressive chemical attack, and corrosion of embedded steel	Containment ISI	Yes, if aging mechanism is significant for inaccessible areas	Consistent with NUREG-1801. Aging effects are managed by the ASME Section XI, Subsection IWL Program. The aging mechanisms are not significant for inaccessible areas. Refer to the evaluation in Subsection 3.5.2.2.1.1.

TABLE 3.5.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTERS II AND III OF NUREG-1801 FOR CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-08	Concrete elements: foundation	Cracks, distortion, and increases in component stress level due to settlement	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. The BSEP primary containment does not rely on a de-watering system for control of settlement. The structure is older than 25 years and has experienced negligible settlement; therefore, this aging effect is not applicable. Nevertheless, the Primary Containment concrete structures are in the scope of the Structures Monitoring Program.
3.5.1-09	Concrete elements: foundation	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	The aging effect/mechanism is not applicable. Refer to the evaluation in Subsection 3.5.2.2.1.2.
3.5.1-10	Concrete elements: foundation, dome, and wall	Reduction of strength and modulus due to elevated temperature	Plant specific	Yes, for any portions of concrete containment that exceed specified temperature limits	Concrete meets the specified temperature limits. Further evaluation is documented in Subsection 3.5.2.2.1.3.
3.5.1-11	Prestressed containment: tendons and anchorage components	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	The Primary Containment Structure is constructed of reinforced concrete. Further evaluation is documented in Subsection 3.5.2.2.1.5.

TABLE 3.5.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTERS II AND III OF NUREG-1801 FOR CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-12	Steel elements: liner plate and containment shell	Loss of material due to corrosion in accessible and inaccessible areas	Containment ISI and containment leak rate test	Yes, if corrosion is significant for inaccessible areas	Consistent with NUREG-1801. Aging effects are managed by the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J Programs for containment pressure boundary components. Further evaluation is documented in Subsection 3.5.2.2.1.4.
3.5.1-13	Steel elements: vent header, drywell head, torus, downcomers, and pool shell	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	CLB fatigue analyses exist for the vent header and downcomers. Fatigue is a TLAA; refer to Subsection 3.5.2.2.1.6.
3.5.1-14	Steel elements: protected by coating	Loss of material due to corrosion in accessible areas only	Protective coating monitoring and maintenance	No	The BSEP coatings program is not relied upon for managing loss of material due to corrosion.
3.5.1-15	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion of prestressing tendons and anchorage components	Containment ISI	No	The Primary Containment Structure is constructed of reinforced concrete. There are no prestressed tendons associated with the Primary Containment Structure design.

TABLE 3.5.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTERS II AND III OF NUREG-1801 FOR CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-16	Concrete elements: foundation, dome, and wall	Scaling, cracking, and spalling due to freeze-thaw; expansion and cracking due to reaction with aggregate	Containment ISI	No	Consistent with NUREG-1801. Aging effects are managed by the ASME Section XI, Subsection IWL Program. The Primary Containment Structure is completely contained within the Reactor Building; and, therefore, not subject to freeze-thaw. Concrete aggregates were selected per ASTM C33, which uses ASTM C227 and ASTM C295. Inspections performed in accordance with IWL will validate the continued absence of reactions with aggregates.
3.5.1-17	Steel elements: vent line bellows, vent headers, and downcomers	Cracking due to cyclic loads; crack initiation and growth due to SCC	Containment ISI and Containment leak rate test	Yes, detection of aging effects is to be evaluated	The ASME Section XI, Subsection IWE Program and the 10 CFR Part 50, Appendix J Program are credited. Further evaluation is documented in Subsection 3.5.2.2.1.7.
3.5.1-18	Steel elements: suppression chamber liner	Crack initiation and growth due to SCC	Containment ISI and containment leak rate test	No	The Primary Containment does not use a stainless steel suppression pool liner. However, the same AMPs are used to manage degradation of the BSEP carbon steel liner as specified in NUREG-1801.
3.5.1-19	Steel elements: drywell head and downcomer pipes	Fretting and lock up due to wear	Containment ISI	No	During normal operating conditions, the Primary Containment Drywell Head and Downcomers are not in contact with other components that could expose them to wear. However, during refueling operations, rubbing contact is possible during removal and reinstallation of the Drywell Head. Drywell Head movement is strictly controlled by procedure; therefore, loss of material due to wear is considered to be negligible.

TABLE 3.5.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTERS II AND III OF NUREG-1801 FOR CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
Class I Structures					
3.5.1-20	All Groups except Group 6: accessible interior/exterior concrete and steel components	All types of aging effects	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	Except for aging effects that are not applicable (Lubrite bearing plate lock-up due to wear), this item is consistent with NUREG-1801, and the applicable program is the Structures Monitoring Program. Further evaluation is documented in Subsection 3.5.2.2.2.1.
3.5.1-21	Groups 1-3, 5, 7-9: inaccessible concrete components, such as exterior walls below grade and foundation	Aging of inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	Plant specific	Yes, if an aggressive below-grade environment exists	Consistent with NUREG-1801. A requirement to examine representative below-grade concrete of the Service Water Intake Structure, when excavated for any reason, will be incorporated as part of the Structures Monitoring Program. Groundwater monitoring is performed periodically. Further evaluation is documented in Subsection 3.5.2.2.2.2.
3.5.1-22	Group 6: all accessible/ inaccessible concrete, steel, and earthen components	All types of aging effects, including loss of material due to abrasion, cavitation, and corrosion	Inspection of water-control structures or FERC/US Army Corp of Engineers dam inspection and maintenance	No	NUREG-1801 recommends using the "Inspection of Water Control Structures" program as the monitoring program; however, the AMP used at BSEP is the Structures Monitoring Program, which provides the necessary guidance to ensure the aging effects are adequately managed.

TABLE 3.5.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTERS II AND III OF NUREG-1801 FOR CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-23	Group 5: liners	Crack initiation and growth due to SCC; loss of material due to crevice corrosion	Water chemistry and monitoring of spent fuel pool water level	No	Consistent with NUREG-1801. Aging effects are managed by the Water Chemistry Program. Spent fuel pool water level is monitored by the plant Technical Specifications.
3.5.1-24	Groups 1-3, 5, 6: all masonry block walls	Cracking due to restraint, shrinkage, creep, and aggressive environment	Masonry wall	No	Consistent with NUREG-1801. Aging effects are managed by the Masonry Wall Program.
3.5.1-25	Groups 1-3, 5, 7-9: Foundation	Cracks, distortion, and increases in component stress level due to settlement	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. No appreciable settlement has been identified for BSEP structures. Further evaluation is documented in Subsection 3.5.2.2.1.2.
3.5.1-26	Groups 1-3, 5-9: foundation	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	BSEP does not have porous concrete sub-foundations and is therefore not subject to the identified aging effect.
3.5.1-27	Groups 1-5: Concrete	Reduction of strength and modulus due to elevated temperature	Plant specific	Yes, for any portions of concrete that exceed specified temperature limits	Concrete meets the specified temperature limits. Further evaluation is documented in Subsection 3.5.2.2.1.3.

TABLE 3.5.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTERS II AND III OF NUREG-1801 FOR CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-28	Groups 7, 8: Liners	Crack Initiation and growth due to SCC; loss of material due to crevice corrosion	Plant specific	Yes	These NUREG-1801 components, stainless steel tank liners, are not applicable to the BSEP design.
Component Supports					
3.5.1-29	All Groups: support members: anchor bolts, concrete surrounding anchor bolts, welds, grout pad, bolted connections, etc.	Aging of component supports	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801 as discussed in Subsection 3.5.2.2.3.1. Degradation is managed by the Structures Monitoring Program.
3.5.1-30	Groups B1.1, B1.2, and B1.3: support members: anchor bolts and welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	This NUREG-1801 item is not applicable as discussed in Subsection 3.5.2.2.3.2.
3.5.1-31	PWR only				

TABLE 3.5.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTERS II AND III OF NUREG-1801 FOR CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-32	Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds, spring hangers, guides, stops, and vibration isolators	Loss of material due to environmental corrosion; loss of mechanical function due to corrosion, distortion, dirt, overload, etc.	ISI	No	Consistent with NUREG-1801. Aging effects are managed by the ASME Section XI, Subsection IWF Program.
3.5.1-33	Group B1.1: high strength low-alloy bolts	Crack initiation and growth due to SCC	Bolting integrity	No	BSEP does not use high-strength, low alloy bolts for support of NSSS components. Therefore, this item is not applicable.

TABLE 3.5.2-1 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – PRIMARY CONTAINMENT

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Anchor / Embedment Embedded	C-2 C-7 C-10	Carbon Steel	Embedded/ Encased	None	None			J, 518
Bellows (Refueling)	C-8	Stainless Steel	Protected from Weather	None	None			J, 529
Cable Tray and Conduit	C-2 C-7 C-10	Galvanized Carbon Steel	Containment Air and Torus Air	None	None			J, 521
		Stainless Steel	Containment Air and Torus Air	None	None			J, 529
Concrete Above Grade	C-1 C-2 C-3 C-6 C-7 C-8 C-10	Reinforced Concrete	Protected from Weather	None	ASME Section XI, Subsection IWL Program	II.B2.2.1-a	3.5.1-07	A, 501, 512, 514
				None	ASME Section XI, Subsection IWL Program	II.B2.2.1-b	3.5.1-07	A, 501, 502, 514, 537
				None	ASME Section XI, Subsection IWL Program	II.B2.2.1-c	3.5.1-16	A, 501, 514, 523
				None	ASME Section XI, Subsection IWL Program	II.B2.2.1-d	3.5.1-07	A, 501, 514, 527, 537
				None	Structures Monitoring Program	II.B2.2.1-e	3.5.1-08	A, 501, 506, 514

TABLE 3.5.2-1 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – PRIMARY CONTAINMENT

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Above Grade (continued)	C-1 C-2 C-3 C-6 C-7 C-8 C-10	Reinforced Concrete	Protected from Weather (continued)	None	None	II.B2.2.1-f	3.5.1-09	I, 507
				None	None	II.B2.2.1-g	3.5.1-10	I, 514, 536
			Containment Air	None	ASME Section XI, Subsection IWL Program	II.B2.2.1-a	3.5.1-07	A, 501, 512, 514
				None	ASME Section XI, Subsection IWL Program	II.B2.2.1-b	3.5.1-07	A, 501, 502, 514, 537
				None	ASME Section XI, Subsection IWL Program	II.B2.2.1-c	3.5.1-16	A, 501, 514, 523
				None	ASME Section XI, Subsection IWL Program	II.B2.2.1-d	3.5.1-07	A, 501, 514, 527, 537
				None	None	II.B2.2.1-g	3.5.1-10	I, 514, 536
				None	Structures Monitoring Program	II.B2.2.1-e	3.5.1-08	A, 501, 506, 514
				None	Structures Monitoring Program	III.A4.1-a	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A4.1-b	3.5.1-20	A, 501, 505
				None	None	III.A4.1-c	3.5.1-27	I, 513
				None	Structures Monitoring Program	III.A4.1-d	3.5.1-20	A, 501, 510

TABLE 3.5.2-1 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – PRIMARY CONTAINMENT

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Above Grade (continued)	C-1 C-2 C-3 C-6 C-7 C-8 C-10	Reinforced Concrete	Containment Air	Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B1.1.4-a III.B1.2.3-a III.B1.3.3-a III.B2.2-a III.B5.2-a	3.5.1-29	A
Sacrificial Shield Wall	C-2 C-3 C-7 C-10	Carbon Steel	Containment Air	Loss of Material	Structures Monitoring Program	III.A4.2-a	3.5.1-20	C
Concrete Curbs	C-13	Reinforced Concrete	Containment Air	None	Structures Monitoring Program	III.A4.1-a	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A4.1-b	3.5.1-20	A, 501, 505
				None	None	III.A4.1-c	3.5.1-27	I, 513
				None	Structures Monitoring Program	III.A4.1-d	3.5.1-20	A, 501, 510
Door	C-3	Carbon Steel	Containment Air	Loss of Material (Includes Wear)	Structures Monitoring Program			J
Downcomers	C-1	Carbon Steel	Torus Air	Loss of Material	ASME Section XI, Subsection IWE Program	II.B1.1.1-a	3.5.1-12	A, 514, 538
				Fatigue	TLAA	II.B1.1.1-c	3.5.1-13	A, 514, 543
			Treated Water	Loss of Material	ASME Section XI, Subsection IWE Program	II.B1.1.1-a	3.5.1-12	A, 514, 538

TABLE 3.5.2-1 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – PRIMARY CONTAINMENT

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Drywell Head	C-1 C-3	Carbon Steel	Containment Air	Loss of Material	ASME Section XI Subsection IWE Program and 10 CFR Part 50, Appendix J Program	II.B1.1.1-a	3.5.1-12	A
Drywell Liner	C-1 C-2 C-7 C-10	Carbon Steel	Containment Air	Loss of Material	ASME Section XI Subsection IWE Program and 10 CFR Part 50, Appendix J Program	II.B1.1.1-a	3.5.1-12	A
Electrical Enclosures	C-2 C-3 C-7 C-10	Carbon Steel	Containment Air and Torus Air	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Containment Air and Torus Air	None	None			F, 521
		Stainless Steel	Containment Air and Torus Air	None	None			F, 529
Electrical Support	C-2 C-7 C-10	Carbon Steel	Containment Air and Torus Air	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Containment Air and Torus Air	None	None			F, 521
Equipment Support	C-2 C-7 C-10	Carbon Steel	Containment Air	Loss of Material	Structures Monitoring Program	III.B4.1-a	3.5.1-29	A

TABLE 3.5.2-1 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – PRIMARY CONTAINMENT

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Floor Drains	C-8	Carbon Steel	Embedded/ Encased	None	None			J, 518
HVAC Support	C-7	Carbon Steel	Containment Air	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Containment Air	None	None			J, 521
Instrument Support	C-2 C-7 C-10	Carbon Steel	Containment Air and Torus Air	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Containment Air	None	None			J, 521
Insulation	C-3	Hydrous Calcium Silicate	Containment Air	None	None			F, 540
Liner (Sump)	C-2	Carbon Steel	Containment Air	Loss of Material	Structures Monitoring Program			J
			Raw Water	Loss of Material	Structures Monitoring Program			J
		Stainless Steel	Containment Air	None	None			J, 529
			Raw Water	Loss of Material	Structures Monitoring Program			J
Moisture Barrier	C-3	Elastomer	Containment Air	Cracking and Change in Material Properties	ASME Section XI, Subsection IWE Program	II.B4.3-a	3.5.1-06	A, 542

TABLE 3.5.2-1 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – PRIMARY CONTAINMENT

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Penetrations	C-1 C-2 C-7 C-10	Carbon Steel	Containment Air and Torus Air	Loss of Material	ASME Section XI Subsection IWE Program and 10 CFR Part 50, Appendix J Program	II.B4.1-a	3.5.1-03	A, 538
			Protected from Weather	Loss of Material	ASME Section XI Subsection IWE Program and 10 CFR Part 50, Appendix J Program	II.B4.1-a	3.5.1-03	A, 538
			Containment Air and Torus Air	None	None	II.B4.1-c	3.5.1-02	I, 541
			Protected from Weather	None	None	II.B4.1-d	3.5.1-02	I, 541
		Elastomers (Structural Sealant)	Containment Air and Torus Air	Cracking and Change in Material Properties	10 CFR Part 50, Appendix J Program			F, 535
			Protected from Weather	Cracking and Change in Material Properties	10 CFR Part 50, Appendix J Program			F, 535

TABLE 3.5.2-1 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – PRIMARY CONTAINMENT

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Personnel Airlock; Equipment Hatch; CRD Hatch	C-1 C-3	Carbon Steel	Containment Air and Torus Air	Loss of Material	ASME Section XI Subsection IWE Program and 10 CFR Part 50, Appendix J Program	II.B4.2-a	3.5.1-04	A, 538
				Loss of Leak Tightness in Closed Condition	10 CFR Part 50, Appendix J Program and Plant Technical Specifications	II.B4.2-b	3.5.1-05	A, 548
			Protected from Weather	Loss of Material	ASME Section XI Subsection IWE Program and 10 CFR Part 50, Appendix J Program	II.B4.2-a	3.5.1-04	A, 538
				Loss of Leak Tightness in Closed Condition	10 CFR Part 50, Appendix J Program and Plant Technical Specifications	II.B4.2-b	3.5.1-05	A, 548
Pipe Support (Class 1)	C-2 C-10	Carbon Steel	Containment Air and Torus Air	Loss of Material	ASME Section XI, Subsection IWF Program	III.B1.1.1-a	3.5.1-32	A
				Loss of Mechanical Function	ASME Section XI, Subsection IWF Program	III.B1.1.3-a	3.5.1-32	A

TABLE 3.5.2-1 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – PRIMARY CONTAINMENT

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pipe Support (Class 2 and 3)	C-2 C-10	Carbon Steel	Containment Air and Torus Air	Loss of Material	ASME Section XI, Subsection IWF Program	III.B1.2.1-a	3.5.1-32	A
				Loss of Mechanical function	ASME Section XI, Subsection IWF Program	III.B1.2.2-a	3.5.1-32	A
Pipe Support (Class MC)	C-2 C-10	Carbon Steel	Torus Air	Loss of Material	ASME Section XI, Subsection IWF Program	III.B1.3.2-a	3.5.1-32	A
			Treated Water	Loss of Material	ASME Section XI, Subsection IWF Program	III.B1.3.2-a	3.5.1-32	A
Pipe Support (General and non-ASME))	C-7	Carbon Steel	Containment Air and Torus Air	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
RPV Support	C-2	Carbon Steel	Containment Air	Loss of Material	ASME Section XI, Subsection IWF Program	III.B1.1.1-a	3.5.1-32	A
Seals and Gaskets	C-1	Elastomer	Containment Air and Torus Air	Cracking and Change in Material Properties	ASME Section XI Subsection IWE Program and 10 CFR Part 50, Appendix J Program	II.B4.3-a	3.5.1-06	A
Slide Bearing Plate	C-7	Lubrite	Containment Air	None	None			J, 524

TABLE 3.5.2-1 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – PRIMARY CONTAINMENT

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Structural Steel	C-2 C-7 C-10	Carbon Steel	Containment Air and Torus Air	Loss of material	Structures Monitoring Program	III.A4.2-a	3.5.1-20	A
			Treated Water	Loss of material	Structures Monitoring Program	III.B5.1-a	3.5.1-29	A
Torus Liner	C-1 C-2 C-5 C-7 C-10 C-12	Carbon Steel	Torus Air	Loss of material	ASME Section XI Subsection IWE Program and 10 CFR Part 50, Appendix J Program	II.B1.1.1-a	3.5.1-12	A, 538
			Treated Water	Loss of material	ASME Section XI Subsection IWE Program and 10 CFR Part 50, Appendix J Program	II.B1.1.1-a	3.5.1-12	A, 538
Vent Header	C-1 C-2	Carbon Steel	Torus Air	Loss of material	ASME Section XI, Subsection IWE Program			H
				Fatigue	TLAA	II.B1.1.1-c	3.5.1-13	A, 543
Vent Line Bellows	C-1	Stainless Steel	Torus Air	None	10 CFR Part 50, Appendix J Program	II.B1.1.1-b II.B1.1.1-d	3.5.1-17	I, 529, 539
Whip Restraints (includes Jet Impingement Shields)	C-11	Carbon Steel	Containment Air and Torus Air	Loss of material	Structures Monitoring Program	III.B5.1-a	3.5.1-29	A

TABLE 3.5.2-2 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – INTAKE AND DISCHARGE CANALS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Canal (Intake Canal only)	C-5 C-7	Earth	Exposed to Weather/ Raw Water	Loss of Form	Structures Monitoring Program	III.A6.4-a	3.5.1-22	E, 511
Sheet Piles	C-7	Carbon Steel	Exposed to Weather/ Below Grade/ Submerged	Loss of Material	Structures Monitoring Program	III.A6.2-a	3.5.1-22	E, 511

TABLE 3.5.2-3 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – REFUELING SYSTEM

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Fuel Prep Machines	C-7	Aluminum	Protected from Weather	Loss of Material	Structures Monitoring Program			J, 503
			Treated Water	Loss of Material	Water Chemistry Program			J
Auxiliary Work Platform	C-7	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J, 503
Refueling Platforms	C-7	Carbon Steel	Protected from Weather	Loss of Material	Inspection of Overhead Heavy Load and Light Load Handling Systems	VII.B.1-b	3.3.1-16	A
				Loss of Material / Wear	Inspection of Overhead Heavy Load and Light Load Handling Systems	VII.B.2-a	3.3.1-16	A
				Cumulative fatigue damage	TLAA	VII.B.1-a	3.3.1-03	A

TABLE 3.5.2-4 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – SWITCHYARD AND TRANSFORMER YARD STRUCTURES

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Anchorage / Embedment	C-10	Carbon Steel	Embedded/ Encased	None	None			J, 518
		Galvanized Carbon Steel	Embedded/ Encased	None	None			J, 519
Cable Tray / Conduit	C-10	Galvanized Carbon Steel	Exposed to Weather	Loss of Material	Structures Monitoring Program			J
			Protected from Weather	None	None			J, 521
Concrete Above Grade	C-10	Concrete	Exposed to Weather	Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B2.2-a	3.5.1-29	A
Concrete Below Grade	C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program			J, 501
Electrical Enclosure	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
			Exposed to Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
			Exposed to Weather	Loss of Material	Structures Monitoring Program			F
Electrical Support	C-10	Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
			Exposed to Weather	Loss of Material	Structures Monitoring Program			F

TABLE 3.5.2-4 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – SWITCHYARD AND TRANSFORMER YARD STRUCTURES

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Equipment Support	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Piles	C-10	Carbon Steel	Driven in undisturbed soil	None	None			J, 522
Siding	C-10	Carbon Steel	Exposed to Weather	Loss of Material	Structures Monitoring Program			J
Structural Steel	C-10	Galvanized Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
		Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J

TABLE 3.5.2-5 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – BRIDGE CRANES

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Reactor Building Bridge Crane	C-2	Carbon Steel	Protected from Weather	Loss of Material	Inspection of Overhead Heavy Load and Light Load Handling Systems	VII.B.1-b	3.3.1-16	A
				Loss of Material / Wear	Inspection of Overhead Heavy Load and Light Load Handling Systems	VII.B.2-a	3.3.1-16	A
				Cumulative Fatigue Damage	TLAA	VII.B.1-a	3.3.1-03	A

TABLE 3.5.2-6 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – GANTRY CRANES

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Intake Structure Gantry Crane	C-7	Carbon Steel	Exposed to Weather	Loss of Material	Inspection of Overhead Heavy Load and Light Load Handling Systems	VII.B.1-b	3.3.1-16	A
				Loss of Material / Wear	Inspection of Overhead Heavy Load and Light Load Handling Systems	VII.B.2-a	3.3.1-16	A
				Cumulative Fatigue Damage	TLAA	VII.B.1-a	3.3.1-03	A

TABLE 3.5.2-7 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – SERVICE WATER INTAKE STRUCTURE

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Anchorage / Embedment	C-2 C-7 C-10	Carbon Steel	Embedded/ Encased	None	None			J, 518
Cable Tray / Conduit	C-2 C-7 C-10	Galvanized Carbon Steel	Exposed to Weather	Loss of Material	Structures Monitoring Program			J. 544
			Protected from Weather	Loss of Material	Structures Monitoring Program			J. 544
		Stainless Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J. 544
Concrete Above Grade	C-2 C-3 C-6 C-7 C-8 C-10	Concrete	Exposed to Weather	None	Structures Monitoring Program	III.A6.1-a	3.5.1-22	A, 501, 504, 511
				None	Structures Monitoring Program	III.A6.1-c	3.5.1-22	A, 501, 505, 511
				Loss of Material	Structures Monitoring Program	III.A6.1-d	3.5.1-22	E, 511
				Loss of Material	Structures Monitoring Program	III.A6.1-e	3.5.1-22	E, 511
				None	Structures Monitoring Program	III.A6.1-f	3.5.1-22	A, 501, 506, 511

TABLE 3.5.2-7 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – SERVICE WATER INTAKE STRUCTURE

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Above Grade (continued)	C-2 C-3 C-4 C-6 C-7 C-8 C-10	Concrete	Protected from Weather	None	Structures Monitoring Program	III.A6.1-c	3.5.1-22	A, 501, 505, 511
				Cracking and Spalling	Fire Protection Program and Structures Monitoring Program	VII.G.1-b	3.3.1-30	A
				Loss of Material	Structures Monitoring Program	III.A6.1-d	3.5.1-22	E, 511
				Loss of Material	Fire Protection Program and Structures Monitoring Program	VII.G.1-c	3.3.1-30	A
				Loss of Material	Structures Monitoring Program	III.A6.1-e	3.5.1-22	E, 511
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B1.2.3-a III.B2.2-a III.B3.2-a III.B4.3-a	3.5.1-29	A
Concrete Below Grade	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program	III.A6.1-a	3.5.1-22	A, 501, 504, 511
				None	Structures Monitoring Program	III.A6.1-c	3.5.1-22	A, 501, 505
				Loss of Material	Structures Monitoring Program	III.A6.1-d	3.5.1-22	E, 511

TABLE 3.5.2-7 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – SERVICE WATER INTAKE STRUCTURE

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Below Grade (continued)	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	Loss of Material	Structures Monitoring Program	III.A6.1-e	3.5.1-22	E, 511
				None	Structures Monitoring Program	III.A6.1-f	3.5.1-22	A, 501, 506, 511
				None	None	III.A6.1-g	3.5.1-26	I, 507
Concrete Submerged	C-2 C-5 C-7 C-8 C-10	Concrete	Raw Water	Loss of Material	Structures Monitoring Program	III.A6.1-b	3.5.1-22	E, 511
				Loss of Material	Structures Monitoring Program	III.A6.1-h	3.5.1-22	E, 511
Doors	C-4 C-7 C-8	Carbon Steel	Exposed to Weather	Loss of Material/ Wear	Fire Protection Program and Structures Monitoring Program	VII.G.1-d	3.3.1-20	A
Electrical Enclosure	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			F, 544
Electrical Support	C-2 C-7 C-10	Galvanized Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			F, 544
		Stainless Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			F, 544

TABLE 3.5.2-7 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – SERVICE WATER INTAKE STRUCTURE

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Equipment Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B4.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			F, 544
Fire Hose Station	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
Floor Drains	C-8	Carbon Steel	Embedded/ Encased	None	None			J, 518
HVAC Support	C-2	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
Instrument Racks	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Stainless Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			F, 544
Instrument Support	C-2 C-7 C-10	Galvanized Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			F, 544
		Stainless Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			F, 544
Masonry Walls	C-8	Concrete Block	Exposed to Weather	Cracking for Masonry Block Walls	Masonry Wall Program	III.A6.3-a	3.5.1-24	A
Penetration	C-2 C-4 C-7 C-10	Sealant	Protected from Weather	Cracking, Delamination & Separation	Fire Protection Program	VII.G.1-a	3.3.1-20	A

TABLE 3.5.2-7 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – SERVICE WATER INTAKE STRUCTURE

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pipe Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	ASME Section XI, Subsection IWF	III.B1.2.1-a	3.5.1-32	A
				Loss of Mechanical Function	ASME Section XI, Subsection IWF	III.B1.2.2-a	3.5.1-32	A
				Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
				None	None	III.B1.2.1-c	3.5.1-30	I, 509
Roof-Membrane/ Built-up	C-3	Elastomer	Exposed to Weather	Change in Material Properties	Structures Monitoring Program			J
Seals and Gaskets	C-3	Elastomer	Exposed to Weather	Change in Material Properties	Structures Monitoring Program			J
Spray Shield	C-13	Aluminum	Protected from Weather	None	None			J, 526
Sprayed on Coatings	C-4	Fire Proofing Material	Protected from Weather	Loss of Material	Fire Protection Program			J
Structural Steel	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.A6.2-a	3.5.1-22	E, 511

TABLE 3.5.2-8 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Anchorage / Embedment	C-2 C-7 C-10	Carbon Steel	Embedded/ Encased	None	None			J, 518
Bellows (RCIC Bellows - MSIV Pit)	C-3	Carbon Steel	Protected from Weather	None	None			J, 546
		Stainless Steel	Protected from Weather	None	None			J, 529
Blow-Out Panel	C-1 C-2 C-3	Galvanized Carbon Steel	Exposed to Weather	None	None			J, 520
		Aluminum	Exposed to Weather	Loss of Material	Structures Monitoring Program			J
		Stainless Steel	Exposed to Weather	None	None			J, 528
Cable Tray / Conduit	C-2 C-7 C-10	Galvanized Carbon Steel	Protected from Weather	None	None			J, 521
Concrete Above Grade	C-1 C-2 C-3 C-6 C-7 C-8 C-10	Concrete	Exposed to Weather	None	Structures Monitoring Program	III.A2.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A2.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A2.1-d	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A2.1-f	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A2.1-h	3.5.1-25	A, 501, 506

TABLE 3.5.2-8 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Above Grade (continued)	C-1 C-2 C-3 C-4 C-6 C-7 C-8 C-10	Concrete	Protected from Weather	None	Structures Monitoring Program	III.A2.1-b	3.5.1-20	A, 501, 512
				None	Structures Monitoring Program	III.A2.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A2.1-d	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A2.1-f	3.5.1-20	A, 501, 510
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B1.2.3-a III.B2.2-a III.B3.2-a III.B4.3-a III.B5.2-a	3.5.1-29	A
				None	None	III.A2.1-j	3.5.1-27	I, 513
				None	Fire Protection Program and Structures Monitoring Program	VII.G.3-b VII.G.3-c	3.3.1-30	A, 501, 534
Concrete Below Grade	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program	III.A2.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A2.1-b	3.5.1-20	A, 512
				None	Structures Monitoring Program	III.A2.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A2.1-e	3.5.1-21	A, 501, 517

TABLE 3.5.2-8 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Below Grade (continued)	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program	III.A2.1-g	3.5.1-21	A, 501, 517
				None	Structures Monitoring Program	III.A2.1-h	3.5.1-25	A, 501, 506
				None	None	III.A2.1-i	3.5.1-26	I, 507
				None	None	III.A2.1-j	3.5.1-27	I, 513
Concrete Curbs	C-13	Concrete	Protected from Weather	None	Structures Monitoring Program			J, 501
Damper Mounting	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
Doors	C-1 C-4 C-8	Carbon Steel	Expose to and Protected from Weather	Loss of Material (Includes Wear)	Fire Protection Program and Structures Monitoring Program	VII.G.3-d	3.3.1-20	A, 534
Electrical Enclosure	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
		Stainless Steel	Protected from Weather	None	None			F, 529

TABLE 3.5.2-8 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Electrical Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Equipment Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B4.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Fire Barrier Assembly	C-4	Fire Proofing Materials	Protected from Weather	Loss of Material	Fire Protection Program			J
Fire Hose Station	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
Floor Drains	C-8	Carbon Steel	Embedded/ Encased	None	None			J, 518
HVAC Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Protected from Weather	None	None			J, 521
Instrument Racks	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521

TABLE 3.5.2-8 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Instrument Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Stainless Steel	Protected from Weather	None	None			F, 529
Liner	C-2	Stainless Steel	Protected from Weather	None	None			F, 529
Liner (includes spent fuel pool gates)	C-2	Stainless Steel	Treated Water	Loss of Material	Water Chemistry Program (and monitoring of spent fuel pool level)	III.A5.2-b	3.5.1-23	A, I, 545, 547
Masonry Walls	C-2 C-4 C-7 C-10	Concrete Block	Protected from Weather	Cracking for Masonry Block Walls	Masonry Wall Program and Fire Protection Program	III.A2.3-a	3.5.1-24	A
Penetrations	C-1 C-2 C-4 C-7 C-10	Sealant	Protected from Weather	Cracking, Delamination & Separation	Fire Protection Program	VII.G.3-a	3.3.1-20	A, 534
Pipe Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	ASME Section XI, Subsection IWF	III.B1.2.1-a	3.5.1-32	A
				Loss of Mechanical Function	ASME Section XI, Subsection IWF	III.B1.2.2-a	3.5.1-32	A
				None	None	III.B1.2.1-c	3.5.1-30	I, 509
				Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A

TABLE 3.5.2-8 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pipe Support	C-2 C-7	Lubrite	Protected from Weather	None	None	III.B1.2.2-a	3.5.1-32	I, 533
Roof-Membrane/ Built-up	C-3	Elastomer	Exposed to Weather	Change in Material Properties & Cracking	Structures Monitoring Program			J
Seals and Gaskets	C-1 C-3	Elastomer	Exposed to Weather	Change in Material Properties & Cracking	Structures Monitoring Program			J
Seals and Gaskets (spent fuel pool gate seals)	C-1 C-3	Elastomer	Treated Water	None	None			J, 531
Siding	C-1 C-3	Galvanized Carbon Steel	Exposed to Weather	None	None			J, 520
Slide Bearing Plate	C-2	Lubrite	Protected from Weather	None	None			J, 524
Slide Bearing Plate	C-2	Lubrite (under the spent fuel storage rack in the fuel pool)	Treated Water	None	None			J, 524, 530

TABLE 3.5.2-8 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – REACTOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Spent Fuel Storage Rack	C-2	Stainless Steel	Treated Water	Loss of Material	Water Chemistry Program			H, 545
		Boral (sand--wiched between two SS tubes)	Treated Water	None	None	VII.A2.1-b	3.3.1-10	I, 532
Spray Shield	C-13	Aluminum	Protected from Weather	None	None			J, 526
Sprayed on Coatings	C-4	Fire Proofing Material	Protected from Weather	Loss of Material	Fire Protection Program			J
Structural Steel	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.A2.2-a	3.5.1-20	A, 538
Tendons	C-2	Carbon Steel	Protected from Weather	Loss of Material	Fuel Pool Girder Tendon Monitoring Program			J
				Loss of Pre-Stress	TLAA			J
Whip Restraints	C-11	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B5.1-a	3.5.1-29	A

TABLE 3.5.2-9 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – AUGMENTED OFF-GAS BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Anchorage / Embedment	C-2 C-7 C-10	Carbon Steel	Embedded/ Encased	None	None			J, 518
Cable Tray / Conduit	C-2 C-7 C-10	Galvanized Carbon Steel	Protected from Weather	None	None			J, 520
Concrete Above Grade	C-2 C-3 C-6 C-7 C-8 C-10	Concrete	Exposed to Weather	None	Structures Monitoring Program	III.A3.1-a	3.5.1-20	A, 501, 504, 516
				None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505, 516
				None	Structures Monitoring Program	III.A3.1-d	3.5.1-20	A, 501, 510, 516
				None	Structures Monitoring Program	III.A3.1-f	3.5.1-20	A, 501, 504, 516
				None	Structures Monitoring Program	III.A3.1-h	3.5.1-25	A, 501, 506, 516
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B2.2-a III.B3.2-a III.B4.3-a III.B5.2-a	3.5.1-29	A

TABLE 3.5.2-9 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – AUGMENTED OFF-GAS BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Above Grade (continued)	C-2 C-3 C-4 C-6 C-7 C-8 C-10	Concrete	Protected from Weather	None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505, 516
				None	Structures Monitoring Program	III.A3.1-d	3.5.1-20	A, 501, 510, 516
				None	Structures Monitoring Program	III.A3.1-f	3.5.1-20	A, 501, 510, 516
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B2.2-a III.B3.2-a III.B4.3-a III.B5.2-a	3.5.1-29	A
				None	None	III.A3.1-j	3.5.1-27	I, 513, 516
				None	Fire Protection Program			J
Concrete Below Grade	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program	III.A3.1-a	3.5.1-20	A, 501, 504, 516
				None	Structures Monitoring Program	III.A3.1-b	3.5.1-20	A, 501, 512, 516

TABLE 3.5.2-9 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – AUGMENTED OFF-GAS BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Below Grade (continued)	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505, 516
				None	Structures Monitoring Program	III.A3.1-e	3.5.1-21	A, 501, 516, 517
				None	Structures Monitoring Program	III.A3.1-g	3.5.1-21	A, 501, 516, 517
				None	Structures Monitoring Program	III.A3.1-h	3.5.1-25	A, 501, 506, 516
				None	None	III.A3.1-i	3.5.1-26	I, 507, 516
				None	None	III.A3.1-j	3.5.1-27	I, 513, 516

TABLE 3.5.2-9 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – AUGMENTED OFF-GAS BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Doors	C-4 C-8	Carbon Steel	Exposed to Weather	Loss of Material (Includes Wear)	Fire Protection Program and Structures Monitoring Program			J
Electrical Enclosure	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Electrical Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Equipment Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B4.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521

TABLE 3.5.2-9 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – AUGMENTED OFF-GAS BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Fire Hose Station	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
Instrument Racks	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
Instrument Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
Masonry Walls	C-2 C-7 C-10	Concrete Block	Protected from Weather	Cracking for Masonry Block Walls	Masonry Wall Program	III.A3.3-a	3.5.1-24	A, 516
Penetrations	C-2 C-4 C-7 C-10	Sealant	Protected from Weather	Cracking, Delamination & Separation	Fire Protection Program			J, 515
Pipe Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
Slide Bearing Plate	C-2	Lubrite	Protected from Weather	None	None			J, 524
Structural Steel	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.A3.2-a	3.5.1-20	A, 516, 538

TABLE 3.5.2-10 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Anchorage / Embedment	C-2 C-7 C-10	Carbon Steel	Embedded/ Encased	None	None			J, 518
Blow-Out Panel	C-2	Galvanized Carbon Steel	Protected from Weather	None	None			J, 521
Cable Tray / Conduit	C-2 C-7 C-10	Galvanized Carbon Steel	Protected from Weather	None	None			J, 521
Concrete Above Grade	C-2 C-3 C-6 C-7 C-8 C-10	Concrete	Exposed to Weather	None	Structures Monitoring Program	III.A3.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A3.1-d	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A3.1-f	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A3.1-h	3.5.1-25	A, 501, 506
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B1.2.3-a III.B2.2-a III.B3.2-a III.B4.3-a III.B5.2-a	3.5.1-29	A

TABLE 3.5.2-10 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Above Grade	C-2 C-3 C-4 C-6 C-7 C-8 C-10	Concrete	Protected from Weather	None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A3.1-d	3.5.1-20	A, 501, 510
				None	Fire Protection Program and Structures Monitoring Program	VII.G.4-b VII.G.4-c	3.3.1-30	A, 501
				None	Structures Monitoring Program	III.A3.1-f	3.5.1-20	A, 501, 510
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B1.2.3-a III.B2.2-a III.B3.2-a III.B4.3-a III.B5.2-a	3.5.1-29	A
				None	None	III.A3.1-j	3.5.1-27	I, 513
Concrete Below Grade	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program	III.A3.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A3.1-b	3.5.1-20	A, 501, 512
				None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A3.1-e	3.5.1-21	A, 501, 517
				None	Structures Monitoring Program	III.A3.1-g	3.5.1-21	A, 501, 517

TABLE 3.5.2-10 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Below Grade (continued)	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program	III.A3.1-h	3.5.1-25	A, 501, 506
				None	None	III.A3.1-i	3.5.1-26	I, 507
				None	None	III.A3.1-j	3.5.1-27	I, 513
Concrete Curbs	C-13	Concrete	Protected from Weather	None	Structures Monitoring Program			J, 501
Damper Mounting	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
Doors	C-4 C-8	Carbon Steel	Protected from Weather	Loss of Material / Wear	Fire Protection Program and Structures Monitoring Program	VII.G.4-d	3.3.1-20	A
Electrical Enclosure	C-2 C-3 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Electrical Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521

TABLE 3.5.2-10 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Equipment Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B4.1-a	3.5.1-29	A
Fire Barrier Assembly	C-4	Fire Proofing Materials	Protected from Weather	Loss of Material	Fire Protection Program			J
Fire Hose Station	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
Floor drains	C-8	Carbon Steel	Embedded/ Encased	None	None			J, 518
HVAC Supports	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
Instrument Racks	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
Instrument Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
Masonry Walls	C-2 C-4 C-7 C-10	Concrete Block	Protected from Weather	Cracking for Masonry Block Walls	Masonry Wall Program and Fire Protection Program	III.A3.3-a	3.5.1-24	A
Penetrations	C-2 C-4 C-7 C-10	Sealant	Protected from Weather	Cracking, Delamination & Separation	Fire Protection Program	VII.G.4-a	3.3.1-20	A

TABLE 3.5.2-10 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – DIESEL GENERATOR BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Pipe Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	ASME Section XI, Subsection IWF	III.B1.2.1-a	3.5.1-32	A
				Loss of Mechanical Function	ASME Section XI, Subsection IWF	III.B1.2.2-a	3.5.1-32	A
				None	None	III.B1.2.1-c	3.5.1-30	I, 509
				Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
Roof-Built-Up	C-3	Elastomer	Exposed to Weather	Change in Material Properties & Cracking	Structures Monitoring Program			J
Siding	C-3	Aluminum	Exposed to Weather	Loss of Material	Structures Monitoring Program			J
Spray Shield	C-13	Aluminum	Protected from Weather	None	None			J, 526
Sprayed on Coatings	C-4	Fire Proofing Materials	Protected from Weather	Loss of Material	Fire Protection Program			J
Structural Steel	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.A3.2-a	3.5.1-20	A, 538

TABLE 3.5.2-11 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Anchorage / Embedment	C-2 C-7 C-10	Carbon Steel	Embedded/ Encased	None	None			J, 518
Battery Rack	C-2	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	A, 508
Cable Tray / Conduit	C-2 C-7 C-10	Galvanized Carbon Steel	Protected from Weather	None	None			J, 521
Concrete Above Grade	C-2 C-3 C-6 C-7 C-8 C-10	Concrete	Exposed to Weather	None	Structures Monitoring Program	III.A2.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A2.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A2.1-d	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A2.1-f	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A2.1-h	3.5.1-25	A, 501, 506
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B2.2-a III.B3.2-a III.B4.3-a III.B5.2-a	3.5.1-29	A

TABLE 3.5.2-11 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Above Grade (continued)	C-2 C-3 C-4 C-6 C-7 C-8 C-10	Concrete	Protected from Weather	None	Structures Monitoring Program	III.A2.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A2.1-d	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A2.1-f	3.5.1-20	A, 501, 510
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B2.2-a III.B3.2-a III.B4.3-a III.B5.2-a	3.5.1-29	A
				None	None	III.A2.1-j	3.5.1-27	I, 513
				None	Fire Protection Program and Structures Monitoring Program	VII.G.3-b VII.G.3-c	3.3.1-30	A, 534
Concrete Below Grade	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program	III.A2.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A2.1-b	3.5.1-20	A, 501, 512
				None	Structures Monitoring Program	III.A2.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A2.1-e	3.5.1-21	A, 501, 517
				None	Structures Monitoring Program	III.A2.1-g	3.5.1-21	A, 501, 517

TABLE 3.5.2-11 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Below Grade (continued)	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program	III.A2.1-h	3.5.1-25	A, 501, 506
				None	None	III.A2.1-i	3.5.1-26	I, 507
				None	None	III.A2.1-j	3.5.1-27	I, 513
Control Room Ceiling	C-7	Incombus-tible Mineral Fiber	Protected from Weather	None	None			J, 525
Damper Mounting	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
Doors	C-1 C-4	Carbon Steel	Protected from Weather	Loss of Material / Wear	Fire Protection Program and Structures Monitoring Program	VII.G.3-d	3.3.1-20	A, 534
Electrical Enclosure	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Electrical Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Equipment Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B4.1-a	3.5.1-29	A

TABLE 3.5.2-11 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Fire Barrier Assembly	C-4	Fire Proofing Materials	Protected from Weather	Loss of Material	Fire Protection Program			J
Fire Hose Station	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
HVAC Supports	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
Instrument Racks	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
Instrument Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
Masonry Walls	C-2 C-4 C-7 C-10	Concrete Block	Protected from Weather	Cracking for Masonry Block Walls	Masonry Wall Program and Fire Protection Program	III.A2.3-a	3.5.1-24	A
Penetrations	C-2 C-4 C-7 C-10	Sealant	Protected from Weather	Cracking, Delamination & Separation	Fire Protection Program	VII.G.3-a	3.3.1-20	A, 534
Pipe Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A

TABLE 3.5.2-11 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – CONTROL BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Raised Floor	C-2	Galvanized Carbon Steel	Protected from Weather	None	None			J, 521
Roof-Membrane / Built-Up	C-3	Elastomer	Exposed to Weather	Change in Material Properties & Cracking	Structures Monitoring Program			J
Seals and Gaskets	C-1	Elastomer	Protected from Weather	Change in Material Properties & Cracking	Structures Monitoring Program			J
Sprayed on Coatings	C-4	Fire Proofing Materials	Protected from Weather	Loss of Material	Fire Protection Program			J
Structural Steel	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.A2.2-a	3.5.1-20	A, 538

TABLE 3.5.2-12 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – TURBINE BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Anchorage / Embedment	C-2 C-7 C-10	Carbon Steel	Embedded/ Encased	None	None			J, 518
Cable Tray / Conduit	C-2 C-7 C-10	Galvanized Carbon Steel	Protected from Weather	None	None			J, 521
Concrete Above Grade	C-2 C-3 C-7 C-8 C-10	Concrete	Exposed to Weather	None	Structures Monitoring Program	III.A3.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A3.1-d	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A3.1-f	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A3.1-h	3.5.1-25	A, 501, 506
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B2.2-a, III.B3.2-a, III.B4.3-a, III.B5.2-a	3.5.1-29	A

TABLE 3.5.2-12 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – TURBINE BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Above Grade (continued)	C-2 C-3 C-4 C-7 C-8 C-10	Concrete	Protected from Weather	None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505
				None	Fire Protection Program and Structures Monitoring Program	VII.G.2-b	3.3.1-30	A, 501
				None	Structures Monitoring Program	III.A3.1-d	3.5.1-20	A, 501, 510
				None	Fire Protection Program and Structures Monitoring Program	VII.G.2-c	3.3.1-30	A, 501
				None	Structures Monitoring Program	III.A3.1-f	3.5.1-20	A, 501, 510
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B2.2-a, III.B3.2-a, III.B4.3-a, III.B5.2-a	3.5.1-29	A
				None	None	III.A3.1-j	3.5.1-27	I, 513
	C-2 C-3 C-7 C-8 C-10	Concrete	Raw Water (Spray & Leakage within the Circulating Water Condenser Pits)	Loss of Material	Structures Monitoring Program			G

TABLE 3.5.2-12 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – TURBINE BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Below Grade	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program	III.A3.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A3.1-b	3.5.1-20	A, 501, 512
				None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A3.1-e	3.5.1-21	A, 501, 517
				None	Structures Monitoring Program	III.A3.1-g	3.5.1-21	A, 501, 517
				None	Structures Monitoring Program	III.A3.1-h	3.5.1-25	A, 501, 506
				None	None	III.A3.1-i	3.5.1-26	I, 507
				None	None	III.A3.1-j	3.5.1-27	I, 513
Concrete Curbs	C-8	Concrete	Protected from Weather	None	Structures Monitoring Program			J, 501
Doors	C-4 C-8	Carbon Steel	Protected from Weather	Loss of Material / Wear	Fire Protection Program and Structures Monitoring Program	VII.G.2-d	3.3.1-20	A

TABLE 3.5.2-12 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – TURBINE BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Electrical Enclosure	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Electrical Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Equipment Support	C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B4.1-a	3.5.1-29	A
Fire Barrier Assembly	C-4	Fire Proofing Materials	Protected from Weather	Loss of Material	Fire Protection Program			J
Fire Hose Station	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
Instrument Racks	C-2	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
Instrument Support	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
Masonry Walls	C-2 C-4 C-7 C-10	Concrete Block	Protected from Weather	Cracking for Masonry Block Walls	Masonry Wall Program and Fire Protection Program	III.A3.3-a	3.5.1-24	A

TABLE 3.5.2-12 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – TURBINE BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Penetrations	C-2 C-4 C-7 C-10	Sealant	Protected from Weather	Cracking, Delamination & Separation	Fire Protection Program	VII.G.2-a	3.3.1-20	A
Pipe Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
Roof-Membrane / Built-Up	C-10	Elastomer	Exposed to Weather	Change in Material Properties & Cracking	Structures Monitoring Program			J
Siding	C-10	Galvanized Carbon Steel	Exposed to Weather	None	None			J, 520
Structural Steel	C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.A3.2-a	3.5.1-20	A, 538

TABLE 3.5.2-13 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – RADWASTE BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Anchorage / Embedment	C-2 C-7 C-10	Carbon Steel	Embedded/ Encased	None	None			J, 518
Cable Tray / Conduit	C-2 C-7 C-10	Galvanized Carbon Steel	Protected from Weather	None	None			J, 521
Concrete Above Grade	C-2 C-3 C-6 C-7 C-8 C-10	Concrete	Exposed to Weather	None	Structures Monitoring Program	III.A3.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A3.1-d	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A3.1-f	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A.3-h	3.5.1-25	A, 501, 506
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B2.2-a III.B3.2-a	3.5.1-29	A

TABLE 3.5.2-13 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – RADWASTE BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Above Grade (continued)	C-2 C-3 C-6 C-7 C-8 C-10	Concrete	Protected from Weather	None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A3.1-d	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A3.1-f	3.5.1-20	A, 501, 510
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B2.2-a III.B3.2-a	3.5.1-29	A
				None	None	III.A3.1-j	3.5.1-27	I, 513
Concrete Below Grade	C-2 C-3 C-7 C-8 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program	III.A3.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A3.1-b	3.5.1-20	A, 501, 512
				None	Structures Monitoring Program	III.A3.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A3.1-e	3.5.1-21	A, 501, 517
				None	Structures Monitoring Program	III.A3.1-g	3.5.1-21	A, 501, 517
				None	Structures Monitoring Program	III.A3.1-h	3.5.1-25	A, 501, 506
				None	None	III.A3.1-i	3.5.1-26	I, 507
				None	None	III.A3.1-j	3.5.1-27	I, 513
Doors	C-8	Carbon Steel	Protected from Weather	Loss of Material (Includes Wear)	Structures Monitoring Program			J

TABLE 3.5.2-13 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – RADWASTE BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Electrical Enclosure	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Electrical Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
Fire Hose Station	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
Instrument Support	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
Pipe Support	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
Roof-Membrane / Built-Up	C-10	Elastomer	Exposed to Weather	Change in Material Properties & Cracking	Structures Monitoring Program			J

TABLE 3.5.2-14 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – WATER TREATMENT BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Anchorage / Embedment	C-10	Carbon Steel	Embedded/ Encased	None	None			J, 518
Battery Rack	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
Cable Tray / Conduit	C-10	Galvanized Carbon Steel	Protected from Weather	None	None			J, 521
Concrete Above Grade	C-10	Concrete	Exposed to Weather	None	Structures Monitoring Program			J, 501
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B2.2-a III.B3.2-a III.B4.3-a	3.5.1-29	A
			Protected from Weather	None	Structures Monitoring Program			J, 501
				Reduction in concrete anchor capacity due to local concrete degradation	Structures Monitoring Program	III.B2.2-a III.B3.2-a III.B4.3-a	3.5.1-29	A
Concrete Below Grade	C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program			J, 501
Electrical Enclosure	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521

TABLE 3.5.2-14 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – WATER TREATMENT BUILDING

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Electrical Support	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
		Galvanized Carbon Steel	Protected from Weather	None	None			F, 521
Equipment Support	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B4.1-a	3.5.1-29	A
Fire Barrier Assembly	C-4	Carbon Steel	Protected from Weather	Loss of Material	Fire Protection Program			J
Instrument Support	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B3.1-a	3.5.1-29	C, 508
Pipe Support	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program	III.B2.1-a	3.5.1-29	A
Siding	C-10	Galvanized Carbon Steel	Exposed to Weather	None	None			J, 520
Structural Steel	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J

TABLE 3.5.2-15 CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – MISCELLANEOUS STRUCTURES AND OUT-BUILDINGS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Anchorage / Embedment	C-2 C-7 C-10	Carbon Steel	Embedded/ Encased	None	None			J, 518
Anchor / Embedment, Exposed	C-2 C-7 C-10	Carbon Steel	Exposed to Weather	Loss of Material	Structures Monitoring Program			J
Cable Tray / Conduit	C-2 C-7 C-10	Galvanized Carbon Steel	Protected from Weather	None	None			J, 521
Concrete BWR Vent Stack	C-2 C-9	Concrete	Exposed to Weather and Below Grade/ Submerged	None	Structures Monitoring Program	III.A9.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A9.1-b	3.5.1-20	A, 501, 512
				None	Structures Monitoring Program	III.A9.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A9.1-d	3.5.1-20	A, 501, 510
				None	Structures Monitoring Program	III.A9.1-e	3.5.1-21	A, 501, 517
				None	Structures Monitoring Program	III.A9.1-f	3.5.1-20	A, 501
				None	Structures Monitoring Program	III.A9.1-g	3.5.1-21	A, 501, 517
				None	Structures Monitoring Program	III.A9.1-h	3.5.1-25	A, 501, 506
				None	None	III.A9.1-i	3.5.1-26	I, 507

TABLE 3.5.2-15 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – MISCELLANEOUS STRUCTURES AND OUT-BUILDINGS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Concrete Below Grade (includes Manholes)	C-2 C-3 C-7 C-10	Concrete	Below Grade/ Submerged	None	Structures Monitoring Program			J, 501
Concrete Above Grade	C-10	Concrete	Exposed to Weather	None	Structures Monitoring Program			J, 501
Tank Foundation	C-7 C-10	Concrete	Exposed to Weather and Below Grade/ Submerged	None	Structures Monitoring Program	III.A8.1-a	3.5.1-20	A, 501, 504
				None	Structures Monitoring Program	III.A8.1-b	3.5.1-20	A, 501, 512
				None	Structures Monitoring Program	III.A8.1-c	3.5.1-20	A, 501, 505
				None	Structures Monitoring Program	III.A8.1-d	3.5.1-21	A, 501, 510, 517
				None	Structures Monitoring Program	III.A8.1-e	3.5.1-21	A, 501, 510, 517
				None	Structures Monitoring Program	III.A8.1-f	3.5.1-25	A, 501, 506
				None	None	III.A8.1-g	3.5.1-26	I, 507
Electrical Enclosure	C-2 C-7 C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			F
		Galvanized Carbon Steel	Exposed to Weather	None	None			F, 520

TABLE 3.5.2-15 (continued) CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORT - SUMMARY OF AGING MANAGEMENT EVALUATION – MISCELLANEOUS STRUCTURES AND OUT-BUILDINGS

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Electrical Support	C-2 C-7 C-10	Galvanized Carbon Steel	Exposed to Weather	None	None			F, 520
Instrument Support	C-2 C-7 C-10	Galvanized Carbon Steel	Exposed to Weather	None	None			J, 508
Piles	C-1	Carbon Steel	Driven in Undisturbed Soil	None	None			J, 522
Siding	C-10	Galvanized Carbon Steel	Exposed to Weather	None	None			J, 520
Structural Steel	C-10	Carbon Steel	Protected from Weather	Loss of Material	Structures Monitoring Program			J
		Galvanized Carbon Steel	Protected from Weather	None	None			J, 521
			Exposed to Weather	None	None			J, 521

<u>Notes for Tables 3.5.2-1 through 3.5.2-15</u>:

Generic Notes:

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E. Consistent with NUREG-1801 for material, environment, and aging effect, but a different AMP is credited.
F. Material not in NUREG-1801 for this component.
G. Environment not in NUREG-1801 for this component and material.
H. Aging effect not in NUREG 1801 for this component, material, and environment combination.
I. Aging effect in NUREG-1801 for this component, material, and environment combination is not applicable.
J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific Notes:

501. Although no aging effects have been identified, the specified NUREG-1801 program will be assigned for management of this commodity, in accordance with the NRC's current position (ISG-03).
502. The BSEP AMR methodology concluded that aggressive chemical attack is not applicable in the Primary Containment. Inspections performed in accordance with IWL will validate the continued absence of aggressive chemical attack.
503. Neither the component nor the AMP is evaluated in NUREG-1801; however, the material, environment, and aging effect are addressed and adequately managed by the Structures Monitoring Program. As such, this component is not consistent with NUREG-1801.
504. In accordance with NUREG-1801 recommendations, no aging management is required because the concrete mix design is per ACI 318, with a low water/cement ratio and entrained air between 3 and 6%.
505. In accordance with NUREG-1801 recommendations, no aging management is required because concrete aggregates were selected per ASTM C33, which uses ASTM C227 & ASTM C295.
506. BSEP does not rely on a de-watering system for control of settlement; the subject structure is older than 25 years and has experienced negligible settlement; as such, this aging effect is not applicable.
507. BSEP does not have a porous concrete subfoundation and does not implement a de-watering system; therefore this aging effect is not applicable and no aging management is required.
508. The anchorage system, addressed by the NUREG-1801 component, is considered a sub-component of the listed civil commodity group.
509. In accordance with NUREG-1801 recommendations, no aging management is required, because no CLB fatigue analysis exists.
510. In accordance with NUREG-1801 recommendation, no aging management is required because the concrete is not exposed to an aggressive environment and has been designed in accordance with ACI 318, with a low water/cement ratio and entrained air between 3 and 6%.
511. Although NUREG-1801 recommends Regulatory Guide 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants", BSEP utilizes the Structures Monitoring Program.
512. In accordance with NUREG-1801 recommendations, no aging management is required, because the structure is not subject to flowing water and the concrete design ensures a dense, well-cured, low permeability concrete with controlled cracking.

513. In accordance with NUREG-1801 recommendations, no aging management is required because the structure is not subject to general area temperatures > 150 °F or local area temperatures > 200 °F.

514. The correlation of the BSEP PCS with NUREG-1801 is unique within the industry because the BSEP Primary Containment is the only BWR Mark I reinforced concrete containment in the United States. Chapter II of NUREG-1801 provides guidance for a BWR mark I steel containment and for a BWR Mark II concrete containment; however, no guidance is provided for a BWR Mark I reinforced concrete containment. The BSEP containment structure is essentially the same as the NUREG-1801 BWR Mark I steel containment except the BSEP containment is a steel-lined, reinforced concrete structure rather than a free standing steel containment. This difference means the BSEP containment structure looks like a BWR Mark I steel containment, with a Drywell and Torus, but is fabricated from reinforced concrete, like a BWR Mark II concrete containment. The NUREG-1801 description of concrete structures and/or components for Mark II concrete containments is sufficiently generic that the concrete portions of the BSEP containment are considered to be consistent with the concrete portions of the NUREG-1801 Mark II concrete containment. The steel elements for the BSEP containment are consistent with the steel elements described for the NUREG-1801 BWR Mark I Steel Containment. The BSEP containment common components are consistent with the BWR Containment Common Components described in NUREG-1801 Chapter II, Section B4.

515. NUREG-1801 does not provide a category for Augmented Off-Gas Building fire barrier penetration seals.

516. Although the Augmented Off-Gas building is not listed in the Group 3, Class I structures, of NUREG-1801, it is a Class I structure and corresponds to the type of structures listed in Group 3; as such, the Group 3 categorization has been assigned to this building.

517. Groundwater monitoring is performed periodically to validate the below-grade environment is not aggressive.

518. The BSEP AMR methodology concluded that carbon/low alloy steel, completely encased in concrete, has no aging effect.

519. The BSEP AMR methodology concluded that galvanized carbon/low alloy steel, completely encased in concrete, has no aging effect.

520. The BSEP AMR methodology concluded that galvanized carbon/low alloy steel, exposed to weather and not subject to an aggressive environment, has no aging effect.

521. The BSEP AMR methodology concluded that galvanized carbon/low alloy steel, protected from weather, has no aging effect.

522. Based on NUREG-1557, steel piles driven in undisturbed soils have been unaffected by corrosion; and those driven in disturbed soil experience minor to moderate corrosion to a small area of metal. Therefore, no aging effects have been concluded for steel piles.

523. BSEP concrete aggregates were selected per ASTM C33, which uses ASTM C227 & ASTM C295. Inspections performed in accordance with IWL will validate the continued absence of reactions with aggregates.

524. The BSEP AMR methodology concluded that Lubrite slide bearing plates have no aging effects, based on the low cycle service requirements and a review of industry and plant specific operational experience.

525. Aging effects for incombustible mineral fiber boards are not developed in the BSEP AMR methodology. However, the boards are located in a temperature and humidity controlled area; as such, components within that environment are not exposed to the mechanisms and effects required to promote component degradation. Additionally, a review of plant operating experience for the control room area has identified no aging effects associated with mineral fiber boards.

526. The BSEP AMR methodology concluded that aluminum in a Protected from Weather environment has no aging effect.

527. BSEP Primary Containment concrete is not exposed to an aggressive environment and has been designed in accordance with ACI 318, with a low water/cement ratio and entrained air between 3 and 6%. Inspections performed in accordance with IWL will validate the continued absence of visible corrosion of embedded steel.

528. The BSEP AMR methodology concluded that stainless steel exposed to weather and not subject to an aggressive environment, has no aging effect.
529. The BSEP AMR methodology concluded that stainless steel in Indoor Air/Protected from Weather environments and not subject to aggressive chemical attack has no aging effect.
530. Based on the original NRC safety evaluation of the High Density Fuel Storage System, dated December 15, 1983, “no significant corrosion should occur in the spent fuel storage racks at Brunswick Units 1 and 2 for a period well in excess of the 40 years design life of the unit.”
531. In accordance with Table 2.1-3 of NUREG-1800, the fuel pool gate seals are tested and replaced on condition per procedure every time the fuel pool gates are removed. Therefore no aging management is required.
532. The BSEP boral plates are sandwiched between the inner and outer wall of the rack tube and are not subject to dislocation, deterioration, or removal; plant specific operating experience and testing results of BSEP boral sample stations have validated the absence of aging effects. As such, no aging management program is required for this commodity.
533. Aging management review of Lubrite slide bearing plates associated with pipe supports is performed within the pipe support commodity group, rather than under the slide bearing plate commodity group. NUREG-1801 identifies loss of mechanical function as an applicable aging effect; however, based on low cycle service requirements and a review of industry and plant specific operational experience, no evidence exists that would indicate this aging effect is relevant.
534. Although the Reactor and Control buildings are not specifically identified in Chapter VII, Section G, Auxiliary Systems, they are sufficiently similar to be considered consistent with the Chapter VII, Section G structure, Auxiliary Building.
535. The AMR methodology concluded that Elastomers could be susceptible to the aging effect of cracking and change of material properties. However, the structural sealants utilized for Electrical Penetrations have been evaluated by the EQ Program as being acceptable for the period of extended operation. Tests performed in accordance with 10 CFR Part 50, Appendix J Program will validate the pressure boundary intended function for Electrical Penetration structural sealants.
536. The bulk average temperature for the BSEP Primary Containment is less than 150 °F; however, trending data for the upper elevations of the Primary Containment have identified a maximum average temperature of 194 °F. Based on an evaluation of Drywell temperatures, the contact temperature at the inside face of the concrete (Drywell side) would be around 175 °F and the contact temperature at the outside face of the concrete (Reactor Building side) would be 107 °F. Because the elevated temperatures are localized to the upper elevation of the Drywell and the actual concrete temperatures are on a gradient through the Drywell wall, the upper elevation of the Drywell is considered a local area, rather than general. As such, the containment concrete elements are not exposed to temperatures which would exceed the thresholds for degradation. These thresholds are consistent with the guidance provided in NUREG-1801 which defines elevated temperatures as greater than150 °F general and 200 °F local.
537. The BSEP primary containment is completely contained within the Reactor Building, as such, the primary containment is not subject to aging effects associated with a below grade exterior environment.
538. The BSEP coatings program is not relied upon for managing loss of material due to corrosion.
539. The AMR methodology concluded that Vent Line Bellows in containment air environment are not susceptible to the aging effect of cracking. The only significant cyclic loads applicable for the Vent Line Bellows were those associated with accident conditions. The number of cyclic loads was determined to be very low and not assumed to increase during the period of extended operation. Nevertheless, the AMP 10 CFR Part 50, Appendix J, would detect cracking should it occur.

540. The AMR methodology concluded that the insulation for hot penetrations, in the containment air environment, has no aging effect.
541. The AMR methodology concluded that hot and cold penetrations in containment air environment are not susceptible to the aging effect of cracking. Nevertheless, the AMPs of ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J would detect cracking should it occur.
542. The intended function for the PCS Moisture Barrier is to prevent intrusion of moisture between the inaccessible concrete mat and the Drywell Liner.
543. This TLAA is further evaluated in Section 4.6.
544. Due to the aggressive environment associated with the Service Water Intake Structure, the subject commodities are considered susceptible to loss of material.
545. The BSEP AMR methodology does not predict SCC, based on the absence of temperatures in excess of 140º F.
546. The BSEP AMR methodology concluded that carbon steel, protected from weather and exposed to an elevated temperature environment, such as lines that normally operate at high temperature, are in a non-wetted environment and not susceptible to general and pitting corrosion.
547. Section 3.7.7 of Technical Specifications requires the spent fuel pool water level to be monitored.
548. Technical Specification Surveillance 3.6.1.2.1 requires primary containment air lock leakage rate testing to be performed in accordance with the Primary Containment Leakage Rate Testing Program.

3.6 AGING MANAGEMENT OF ELECTRICAL AND INSTRUMENTATION AND CONTROLS

3.6.1 INTRODUCTION

Section 3.6 provides the results of the aging management reviews (AMRs) for those components/commodities identified in Subsection 2.5, Scoping and Screening Results – Electrical and Instrumentation and Controls (I&C) Systems, subject to aging management review. The components/commodities subject to aging management review are:

1. Non-EQ Insulated Cables and Connections (Subsection 2.5.3.1)
2. Phase Bus (Subsection 2.5.3.2)
3. Non-EQ Electrical/I&C Penetration Assemblies (Subsection 2.5.3.3)
4. High Voltage Insulators (Subsection 2.5.3.4)
5. Switchyard Bus (Subsection 2.5.3.5)
6. Transmission Conductors (Subsection 2.5.3.6)

Table 3.6.1, Summary of Aging Management Evaluations in Chapter VI of NUREG-1801 for Electrical Components, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component/commodity groups in this Section. Table 3.6.1 uses the format of Table 1 described in Section 3.0 above.

3.6.1.1 Operating Experience

The AMR methodology applied at BSEP included use of operating experience (OE) to confirm the set of aging effects that had been identified through material/environment evaluations. Plant-specific and industry OE through March 18, 2003 was identified and reviewed. OE subsequent to that date will be reviewed and applicable OE will be updated, as required, in conjunction with the amendment to the application required by 10 CFR 54.21(b). The OE review consisted of the following:

Site: BSEP site-specific OE was reviewed. The site-specific OE included a review of (1) Action Tracking Database, (2), Maintenance Rule Database, and (3) Licensee Event Reports. The site-specific OE review identified no additional or unique aging effects requiring management.

Industry: An evaluation of industry OE published since the effective date of NUREG-1801, “Generic Aging Lessons Learned (GALL),” U. S. Nuclear Regulatory Commission, April 2001, was performed to identify any additional aging effects requiring management. The review considered the information in SAND 96-0344, Aging Management Guideline for Commercial Nuclear Power Plants – Electrical Cable and Terminations, September 1996, which consolidates historical maintenance and industry OE for evaluation of aging mechanisms and effects. The industry OE review identified no additional aging effects requiring management.

On-Going On-going review of plant-specific and industry operating experience is continuing to be performed in accordance with the Corrective Action Program and the Progress Energy internal OE review process.

3.6.2 RESULTS

The following table summarizes the results of the aging management review for components/commodities in the Electrical and I&C Systems area.

Table 3.6.2-1 Electrical and I&C Systems – Summary of Aging Management Evaluation – Electrical/I&C Components/Commodities

This table uses the format of Table 2 described in Section 3.0 above.

3.6.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The materials from which specific components/commodities are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each component/commodity in the following subsections.

3.6.2.1.1 Non-EQ Insulated Cables and Connections

Materials

The materials of construction for the Insulated Cables and Connection components are:

I&C Cable Insulation	Power Cable Insulation	Connections
EPDM	EPR	EPDM
EPR	HTK	EPR
Teflon, FEP	XLP, XLPE, XLPO	Kapton
HTK		Melamine
Kapton		Phenolic
PVC		XLP, XLPE, XLPO
SR		
Tefzel		
XLP, XLPE, XLPO		

Environment

The Non-EQ Insulated Cables and Connection components are exposed to adverse localized conditions of:

- Heat, Oxygen
- Radiation, Oxygen
- Moisture and Voltage Stress

Aging Effects Requiring Management

Except for medium voltage cables subject to wetting, the aging management review of Non-EQ Insulated Cables and Connections identified no aging effects requiring management based on an analysis of 60-year service limiting environments for the insulating materials. Nevertheless, aging effects have been assumed to exist for Non-EQ Insulated Cables and Connections that may be exposed to adverse localized environments and for Non-EQ Insulated Cables and Connections associated with radiation monitoring and neutron flux monitoring circuits. Therefore, the following Non-EQ Insulated Cables and Connection aging effects were determined to require management:

- Reduced Insulation Resistance
- Electrical Failure (breakdown of insulation)

Aging Management Programs

The following AMPs manage the aging effects for the Non-EQ Insulated Cables and Connection components:

- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program
- Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program
- Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

3.6.2.1.2 Phase bus

Materials

The materials of construction for the Phase bus components are:

- Aluminum
- Bronze
- Copper
- Galvanized Metal

- Porcelain
- Polyester Fiberglass
- Silicone Caulk
- Steel

Environment

The Phase bus components are exposed to the following:

- Heat, Oxygen (including Ohmic heating)

Aging Effects Requiring Management

The following potential Phase bus aging effect will be managed:

- Increased Heating/Loosening of Bolted Connections Leading to Electrical Failure

Aging Management Programs

The following AMP manages the potential aging effect for the Phase bus components:

- Phase Bus Aging Management Program

3.6.2.1.3 Non-EQ Electrical/I&C Penetration Assemblies

Materials

The materials of construction for the Non-EQ Electrical/I&C Penetration Assemblies are:

- XLPE, XLPO, and SR internal conductor/pigtail insulation
- Dow Corning (DC) 185 Encapsulant
- Ceramic

Environment

The Non-EQ Electrical/I&C Penetration Assemblies are exposed to the following:

- Heat, Oxygen
- Radiation, Oxygen

Aging Effects Requiring Management

The Non-EQ Electrical/I&C Penetration Assemblies subject to AMR are Westinghouse Class E or Class D2 assemblies. The penetration assembly primary insulation materials are XLPE, XLPO, and SR. The aging management review of these materials identified no aging effects requiring management based on an analysis of 60-year service limiting environments for the penetration locations in the lower Drywell. Also, an aging analysis of the DC 185 encapsulant determined that the material is acceptable for a 60-year service life inside the lower Drywell. Therefore, the Non-EQ Electrical/I&C Penetration Assemblies have no aging effects requiring management for the period of extended operation.

Aging Management Programs

The aging management review determined that no aging management activities are required for the extended period of operation for the organic insulating and encapsulant materials within the penetration assemblies. Therefore, no AMPs are required for the Non-EQ Electrical/I&C Penetration Assemblies. . However, as a conservative measure, potential aging effects of penetration pigtail wiring insulation will be addressed by the Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Program.

3.6.2.1.4 High Voltage Insulators

Materials

The materials of construction for the High Voltage Insulators are:

- Porcelain
- Metal (Galvanized Iron, Galvanized Steel)
- Portland Cement Porcelain Jointing Material

Environment

The High Voltage Insulator components are exposed to the following:

- Outdoor (Transformer Yard, Switchyard)

Aging Effects Requiring Management

The High Voltage Insulators have no aging effects requiring management.

Aging Management Programs

Because there are no aging effects requiring management, no AMPs are required for the High Voltage Insulators.

3.6.2.1.5 Switchyard Bus

Materials

The materials of construction for the Switchyard Bus components are:

- Aluminum

- Galvanized Steel

Environment

The Switchyard Bus components are exposed to the following:

- Outdoor (Switchyard)

Aging Effects Requiring Management

The Switchyard Bus has no aging effects requiring management.

Aging Management Programs

Because there are no aging effects requiring management, no AMPs are required for the Switchyard Bus.

3.6.2.1.6 Transmission Conductors

Materials

Transmission conductors are Type ACSR (aluminum conductor steel reinforced). The materials of construction for the Transmission Conductor components are:

- Aluminum
- Steel

Environment

The Transmission Conductors are exposed to the following:

- Outdoor (Transformer Yard, Switchyard)

Aging Effects Requiring Management

The Transmission Conductors have no aging effects requiring management.

Aging Management Programs

Because there are no aging effects requiring management, no AMPs are required for the Transmission Conductors.

3.6.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the LRA. For the Electrical and I&C Systems, those programs are addressed in the following subsections.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Environmental Qualification (EQ) is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). Environmental qualification aging analyses may involve a TLAA as discussed in Section X.E1 of NUREG-1801. Aging evaluations for EQ components that specify a qualified life of 40 years are considered to be TLAAs for license renewal. Also, see Subsection 3.6.2.3 below.

3.6.2.3 Time-Limited Aging Analysis

The Time-Limited Aging Analysis (TLAA) identified below is associated with the Electrical and I&C System components. The subsection of the application that contains the TLAA review results is indicated in parenthesis.

1. Environmental Qualification (Section 4.4, Environmental Qualification of Electrical Equipment)

3.6.3 CONCLUSIONS

The Electrical and I&C System components/commodities having aging effects requiring management have been evaluated, and aging management programs have been selected to manage the aging effects. A description of the aging management programs is provided in Appendix B, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging will be adequately managed so that there is reasonable assurance that the intended functions of Electrical and I&C Systems components/commodities will be maintained consistent with the current licensing basis during the period of extended operation.

TABLE 3.6.1 SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VI OF NUREG-1801 FOR ELECTRICAL COMPONENTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-01	Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements	Degradation due to various aging mechanisms	Environmental qualification of electric components	Yes, TLAA	This TLAA is further evaluated in Section 4.4. Further evaluation documented in Subsection 3.6.2.2.1.
3.6.1-02	Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure caused by thermal/ thermoxidative degradation of organics; radiolysis and photolysis (ultraviolet [UV] sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Aging management program for electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG-1801.

TABLE 3.6.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VI OF NUREG-1801 FOR ELECTRICAL COMPONENTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-03	Electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/ thermoxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Aging management program for electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements	No	The AMP is consistent with NUREG-1801 for cables used in instrumentation circuits for radiation monitoring. However, the test methods utilized for detecting the aging effects of the instrumentation cables associated with neutron monitoring instrumentation circuits is based on ISG-15 rather than NUREG-1801.
3.6.1-04	Inaccessible medium-voltage (2kV to 15kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	Formation of water trees; localized damage leading to electrical failure (breakdown of insulation) caused by moisture intrusion and water trees	Aging management program for inaccessible medium-voltage cables not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG-1801.

TABLE 3.6.1 (continued) SUMMARY OF AGING MANAGEMENT EVALUATIONS IN CHAPTER VI OF NUREG-1801 FOR ELECTRICAL COMPONENTS

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1-05	PWR only				

TABLE 3.6.2-1 ELECTRICAL AND I&C SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – ELECTRICAL/I&C COMPONENTS/COMMODITIES

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-EQ Insulated Cables and Connections	E-1	Various Organic Polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/ thermoxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program	VI.A.1-a	3.6.1- 02	A, 601
Medium-Voltage Power Cables	E-1	Various Organic Polymers	Adverse localized environment caused by exposure to moisture and voltage	Formation of water trees, localized damage leading to electrical failure (breakdown of insulation)	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program	VI.A.1-c	3.6.1- 04	A

TABLE 3.6.2-1 (continued) ELECTRICAL AND I&C SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – ELECTRICAL/I&C COMPONENTS/COMMODITIES

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-EQ Cables Used in Radiation Monitoring Instrumentation Circuits	E-1	Various Organic Polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/ thermoxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program	VI.A.1-b	3.6.1- 03	A, 602
Non-EQ Cables Used in Neutron Flux Instrumenta-tion Circuits	E-1	Various Organic Polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/ thermoxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program	VI.A.1-b	3.6.1- 03	B, 602, 603
Phase Bus	E-1	Various Metals, Porcelain, PVC, Silicon Caulk	Adverse localized environment caused by heat, or moisture	Oxidation, Loosening of bolted connections due to thermal cycling, Corrosion due to moisture	Phase Bus Aging Management Program			J

TABLE 3.6.2-1 (continued) ELECTRICAL AND I&C SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – ELECTRICAL/I&C COMPONENTS/COMMODITIES

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-EQ Electrical and I&C Penetration Assemblies	E-1	XLPE, XLPO, SR, Ceramic, DC 185 encapsulant	Adverse localized environment caused by heat or radiation in the presence of oxygen	None	None			604
Non-EQ Electrical and I&C Penetration Assembly Pigtails	E-1	XLPO, XLPE	Adverse localized environment caused by heat or radiation in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/ thermoxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program	VI.A.1-a	3.6.1- 02	A, 605
High-Voltage Insulators	E-2	Porcelain, Metal, Cement	Outdoor	None	None			J, 606
Switchyard Bus	E-1	Aluminum, Galvanized Steel	Outdoor	None	None			J, 607
Transmission Conductors	E-1	Aluminum, Steel	Outdoor	None	None			J, 608

Notes for Table 3.6.2-1:

Generic Notes:

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E. Consistent with NUREG-1801 for material, environment, and aging effect, but a different AMP is credited.
F. Material not in NUREG-1801 for this component.
G. Environment not in NUREG-1801 for this component and material.
H. Aging effect not in NUREG 1801 for this component, material, and environment combination.
I. Aging effect in NUREG-1801 for this component, material, and environment combination is not applicable.
J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific Notes:

601. There are no BSEP fuse holders that meet the screening criteria defined in ISG-5. Therefore, no aging management program for fuse holders is warranted under ISG-5. However, since fuse holders represent another type of electrical connection similar to terminal blocks, fuse holders are included in the aging management program for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements.
602. The scope of this program applies to non-EQ cables used in the process radiation monitoring instrumentation circuits, area radiation monitoring instrumentation circuits, and neutron monitoring instrumentation circuits that are sensitive to a reduction in insulation resistance.
603. The test methods utilized for detecting the aging effects of the non-EQ cables associated with the neutron monitoring instrumentation circuits is based on industry comments to ISG-15.
604. Evaluation has shown that the insulation materials for the non-EQ Westinghouse Class E and Class D2 electrical penetration assemblies are aptly suited for their service conditions and acceptable for the period of extended operation.
605. The aging management program for Electrical Cables and Connections Not Subject To 10 CFR 50.49 EQ Requirements is applicable to the penetration assembly pigtails.

606. Surface contamination is not an applicable aging mechanism. The buildup of surface contamination is typically a slow, gradual process. BSEP is located in a rural area where airborne particle concentrations are comparatively low. Consequently, the rate of contamination buildup on the insulators is not significant. Any such contamination accumulation is washed away naturally, by rainwater. The glazed surface on high-voltage insulators at BSEP aids in the removal of this contamination. In March 1993, the Unit 2 switchyard experienced a flashover of some high-voltage insulators. The incident was attributed to a severe winter storm with gale force winds that persisted in the area for a number of days. The incident was considered a highly unusual atmospheric event and was not attributed to actual aging of the insulators but rather to the storm itself. The storm was unusual because it contained high winds but little or no precipitation to wash away the salt spray on the insulators. An event like this had not occurred prior or subsequent to March 1993. As the March 1993 incident was event-driven, it is concluded that surface contamination is not an applicable stressor for the high-voltage insulators within the scope of this review when exposed to their normal service conditions. Therefore, no aging management activities are required for the extended period of operation. This event resulted in the issuance of NRC IN 93-95, Storm-Related Loss of Offsite Power Events Due to Salt Buildup on Switchyard Insulators.

    Cracking is not an applicable aging mechanism. Cracking or breaking of porcelain insulators is typically caused by physical damage which is event-driven rather than an age-related mechanism. Mechanical wear is an aging effect for strain and suspension insulators if they are subject to significant movement. BSEP transmission conductors do not normally swing and when they do, because of strong winds, they dampen quickly once the wind has subsided. Loss of material due to wear has not been identified during routine inspections at BSEP. It is concluded that no aging management activities are required for this commodity group.

607. Connection surface oxidation is not an applicable aging effect. All switchyard bus connections have welded and/or compression connections. For the service conditions encountered at BSEP, no aging effects have been identified that could cause a loss of intended function. Vibration is not an applicable aging mechanism since switchyard bus has no connections to moving or vibrating equipment. Switchyard buses are connected to flexible conductors that do not normally vibrate and are supported by insulators mounted to static, structural components such as concrete footings and structural steel. This configuration provides reasonable assurance that switchyard bus will perform its intended function for the extended period of operation.

608. Loss of conductor strength due to corrosion of ACSR transmission conductors is a very slow process. This process is even slower for rural areas with generally less suspended particles and SO_2 concentrations in the air than urban areas. BSEP is located in a rural area where airborne particle concentrations are comparatively low. Consequently, this is not considered a significant contributor to the aging of BSEP transmission conductors. Transmission conductor vibration would be caused by wind loading. Wind loading is considered in the initial design and field installation of transmission conductors and high-voltage insulators throughout the CP&L, doing business as Progress Energy Carolinas, Inc., transmission and distribution network. Compression connections to transmission conductors are equipped with Belleville washers which provide vibration absorption and prevent loosening. Loss of material (wear) and fatigue that could be caused by transmission conductor vibration or sway are not considered applicable aging effects that warrant aging management. It is concluded that no aging management activities are required for this commodity group.

4.0 TIME-LIMITED AGING ANALYSES

Two areas of technical review are required to support an application for a renewed operating license. The first area of technical review is the Integrated Plant Assessment, described in Chapters 2 and 3. The second area of technical review is the identification and evaluation of plant-specific time-limited aging analyses and exemptions, provided in this chapter.

The evaluations included in this chapter meet the requirements contained in10 CFR 54.21(c) and allow the NRC to make the finding contained in 10 CFR 54.29(a)(2).

4.1 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES

10 CFR 54.21(c) requires that an evaluation of time-limited aging analyses be provided as part of the application for a renewed license. Time-limited aging analyses are defined in 10 CFR 54.3 as those licensee calculations and analyses that:

1. Involve systems, structures, and components within the scope of license renewal, as delineated in 10 CFR 54.4(a);

2. Consider the effects of aging;

3. Involve time-limited assumptions defined by the current operating term, for example, 40 years;

4. Were determined to be relevant by the licensee in making a safety determination;

5. Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in 10 CFR 54.4(b); and

6. Are contained or incorporated by reference in the current licensing basis.

4.1.1 TIME-LIMITED AGING ANALYSES IDENTIFICATION PROCESS

The process used to identify the BSEP-specific time-limited aging analyses is consistent with the guidance provided in NEI 95-10, "Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule." Calculations and evaluations that could potentially meet the six criteria of 10 CFR 54.3 were identified by searching CLB documents including:

- Technical Specifications,
- The UFSAR,
- Docketed licensing correspondence,
- Design Basis Documents,
- General Electric Project Task Reports for Extended Power Uprate, and
- BWRVIP documents.

Industry-prepared documents that list generic time-limited aging analyses also were reviewed to provide additional assurance of the completeness of the plant-specific list. These documents included NEI 95-10; NUREG-1800, Standard Review Plan for License Renewal; NUREG-1801, Generic Aging Lessons Learned Report; NRC proposed Interim Staff Guidance (ISG) letter 16, and NRC safety evaluation reports related to license renewal applications by other BWR licensees.

The potential TLAAs were evaluated by screening against the six criteria in the definition of TLAA in 10 CFR 54.3. The calculations and evaluations that meet all six criteria of 10 CFR 54.3 are the time-limited aging analyses for BSEP and are listed in Table 4.1-1.

Table 4.1-2 summarizes the results of reviewing the generic list of TLAAs provided on Tables 4.1-2 and 4.1-3 of NUREG-1800.

4.1.2 EVALUATION OF TIME-LIMITED AGING ANALYSES

As required by10 CFR 54.21(c)(1), an evaluation of BSEP-specific time-limited aging analyses must be performed to demonstrate that:

(i) The analyses remain valid for the period of extended operation;

(ii) The analyses have been projected to the end of the period of extended operation; or

(iii) The effects of aging on the intended functions(s) will be adequately managed for the period of extended operation.

The results of these evaluations are summarized in Table 4.1-1 and discussed in Sections 4.2 through 4.7.

4.1.3 IDENTIFICATION OF EXEMPTIONS

54.21(c) also requires that the application for a renewed license include 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. This was performed by evaluating the basis for each active exemption, granted pursuant to 10 CFR 50.12, to determine whether the exemption was based on a time-limited aging analysis.

As a result of this review, one exemption was identified as meeting the definition of a TLAA. The exemption to the requirements of 10 CFR 50, Appendix G, involves an analysis for the development of revised reactor vessel Pressure-Temperature (P-T) curves using alternative fracture toughness methods. The analysis supporting this exemption meets all the criteria for a TLAA and has been included on Table 4.1-1.

TABLE 4.1-1 TIME-LIMITED AGING ANALYSES

NUREG-1800 TLAA Category	Analysis	10 CFR 54.21(c)(1) Paragraph	Section
1.	**Reactor Vessel Neutron Embrittlement**		4.2
	Neutron Fluence	54.21(c)(1)(ii)	4.2.1
	Upper Shelf Energy Evaluation		-
	Reactor Vessel Plates and Welds	54.21(c)(1)(ii)	4.2.2 1
	Reactor Vessel Nozzle Forgings	54.21(c)(1)(i)	4.2.2.2
	Adjusted Reference Temperature Analysis	54.21(c)(1)(ii)	4.2.3
	RPV Operating Pressure-Temperature (P-T) Limits	54.21(c)(1)(ii)	4.2.4
	RPV Circumferential Weld Examination Relief	54.21(c)(1)(ii)	4.2.5
	RPV Axial Weld Failure Probability	54.21(c)(1)(ii)	4.2.6
	Core Shroud Reflood Thermal Shock Analysis	54.21(c)(1)(ii)	4.2.7
	Core Plate Plug Spring Stress Relaxation	54.21(c)(1)(iii)	4.2.8
	Core Shroud Repair Hardware Analysis	54.21(c)(1)(i)	4.2.9
2.	**Metal Fatigue**		4.3
	Reactor Vessel Fatigue Analyses	54.21(c)(1)(ii), 54.21(c)(1)(iii)	4.3.1
	Reactor Vessel Internals Fatigue Analyses	54.21(c)(1)(ii), 54.21(c)(1)(iii)	4.3.2
	Effects of Reactor Coolant Environment on Fatigue life of Components and Piping (Generic Safety Issue 190)	54.21(c)(1)(ii), 54.21(c)(1)(iii)	4.3.3
	Reactor Coolant Pressure Boundary Piping and Component Fatigue Analysis		-
	Implicit Fatigue Analysis Design Basis and Methodology	54.21(c)(1)(ii)	4.3.4.1
	Reactor Vessel Level Instrumentation Condensing Unit Fatigue Analyses	54.21(c)(1)(ii)	4.3.4.2
3.	**Environmental Qualification of Electric Equipment**	54.21(c)(1)(iii)	4.4
4.	**Concrete Containment Tendon Prestress**	Not Applicable	4.5
5.	**Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis**		4.6
	Torus Downcomer/Vent Header Thermal Fatigue Analysis	54.21(c)(1)(ii)	4.6.1
	Torus-Attached and SRV Piping System Fatigue Analyses	54.21(c)(1)(ii)	4.6.2

TABLE 4.1-1 (continued) TIME-LIMITED AGING ANALYSES

NUREG-1800 TLAA Category	Analysis	10 CFR 54.21(c)(1) Paragraph	Section
6.	**Other Plant-Specific Time-Limited Aging Analyses**		4.7
	Service Level I Coating Qualification	54.21(c)(1)(ii)	4.7.1
	Fuel Pool Girder Tendon Loss of Prestress	54.21(c)(1)(iii)	4.7.2
	Crane, Refueling Platform, and Monorail Hoist Cyclic Load Limits		-
	Reactor Building Cranes	54.21(c)(1)(ii)	4.7.3.1
	Refueling Platforms	54.21(c)(1)(ii)	4.7.3.2
	Intake Structure Crane	54.21(c)(1)(ii)	4.7.3.3
	Diesel Generator Cranes	54.21(c)(1)(ii)	4.7.3.4
	Miscellaneous Monorails/Hoists	54.21(c)(1)(ii)	4.7.3.5
	Torus Component Corrosion Allowance	54.21(c)(1)(ii), 54.21(c)(1)(iii)	4.7.4

TABLE 4.1-2 REVIEW OF GENERIC TLAAs LISTED ON TABLES 4.1-2 AND 4.1-3 OF NUREG-1800

NUREG-1800 Generic TLAA Examples	Applicability to BSEP	Section
NUREG-1800, Table 4.1-2		
Reactor vessel neutron embrittlement	Yes	4.2
Concrete containment tendon prestress	No - BSEP containments have no prestressed tendons	-
Metal fatigue	Yes	4.3
Environmental qualification of electrical equipment	Yes	4.4
Metal corrosion allowance	No - No explicit 40-year basis applies.	-
Inservice flaw growth analyses that demonstrate structure stability for 40 years	Yes	4.2, 4.3, 4.7.3
Inservice local metal containment corrosion analyses	Yes	4.7.4
High-energy line-break postulation based on fatigue cumulative usage factor	No – All break locations were considered.	-
NUREG-1800, Table 4.1-3		
Intergranular separation in the heat-affected zone (HAZ) of reactor vessel low-alloy steel under austenitic SS cladding. Low-temperature overpressure (LTOP) analyses	No – No HAZ analysis and no LTOP analysis were identified within the CLB.	-
Fatigue analysis for the main steam supply lines to the turbine driven auxiliary feedwater lines	No – Auxiliary Feedwater System is not applicable to BSEP.	-
Fatigue analysis for the reactor coolant pump flywheel	No – BSEP Recirculation System pumps do not have flywheels.	-
Fatigue analysis of polar crane	Yes – Reactor Building Crane	4.7.3.1
Flow-induced vibration endurance limit, transient cycle count assumptions, and ductility reduction of fracture toughness for the reactor vessel internals	No – No analyses were identified within the CLB for the reactor vessel internals related to these topics.	-
Leak before break	No – No explicit 40-year basis applies.	-
Fatigue analysis for the containment liner plate	No – No fatigue evaluations were performed.	-
Containment penetration pressurization cycles	No – No fatigue evaluations were performed.	-
Reactor vessel circumferential weld inspection relief (BWR)	Yes	4.2.5

4.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

Neutron embrittlement is the term used to describe changes in mechanical properties of reactor vessel materials that result from exposure to fast neutron flux (E>1.0 MeV) within the vicinity of the reactor core, called the beltline region. The most pronounced material change is a reduction in fracture toughness. As fracture toughness decreases with cumulative fast neutron exposure, the material's resistance to crack propagation decreases.

Fracture toughness of ferritic materials is not only dependent upon fluence, but is also dependent upon temperature. The nil-ductility temperature, RT_{NDT}, is the temperature above which the material behaves in a ductile manner, and below which it behaves in a brittle manner. As fluence increases, the nil-ductility reference temperature increases. This means higher temperatures are required for the material to continue to act in a ductile manner. This shift in reference temperature is the ΔRT_{NDT} plus a margin term which is added to account for uncertainties associated with the limited amount of data available for making the projections. The projected reduction in fracture toughness as a function of fluence impacts several analyses used to support operation of BSEP:

- Reactor Pressure Vessel (RPV) Fluence
- RPV Material Upper-Shelf Energy (USE)
- RPV Adjusted Reference Temperature (ART)
- RPV Operating Pressure-Temperature (P-T) Limits
- RPV Circumferential Weld Examination Relief
- RPV Axial Weld Failure Probability
- Core Shroud Reflood Thermal Shock Analysis
- Core Plate Plug Spring Stress Relaxation
- Core Shroud Repair Hardware Analysis

Since extending the operating period from 40 years to 60 years will further increase the fluence levels, the 60-year fluence value must be determined and used to determine its impact upon USE and ART calculations, P-T limit curves, analyses supporting RPV circumferential weld examination relief, reflood shock analyses, and core plate plug spring relaxation analysis. If the existing analyses cannot be demonstrated to remain valid for 60 years, a new analysis will be prepared for 60 years for each of these topics, where feasible. If a revised analysis is not feasible, the aging effect identified within the TLAA will be managed during the period of extended operation.

Proposed Interim Staff Guidance (ISG)-16, Section 4.2, Reactor Vessel Neutron Embrittlement, was used as a reference in preparing this evaluation.

4.2.1 NEUTRON FLUENCE

The rate of neutron exposure is called the neutron flux, and the cumulative degree of neutron exposure is called the neutron fluence. Neutron flux is a function of reactor power level, and is measured continuously. Neutron fluence projections including the period of extended operation are required to permit determination of the effect of the increased neutron exposure upon reactor vessel material properties. Neutron fluence projections are made based upon measured flux data from past operation and projected power levels and operating efficiency estimates for future operation. Cavity dosimetry has been utilized at BSEP in the past to provide further confirmation of fluence values during previous operation. In addition, one surveillance capsule has been removed from each unit that provided dosimetry information that is used to measure past fluence. These data have been used in developing a fluence projection calculation which predicts the cumulative fluence for the reactor vessel and internals in BSEP Unit 1 and 2 for 54 effective full power years (EFPY), which bounds 60 years of operation. The methodology for fluence projections must meet the requirements of Regulatory Guide 1.190.

Analysis

A calculation has been performed to determine fluence projections applicable for the reactor vessel and internals for the current operating term and at 54 EFPY, which bounds 60 years of operation. This fluence analysis was prepared by Westinghouse Electric Corporation (W) for BSEP Units 1 and 2, and was used as the basis for developing Pressure-Temperature Limit Curves for up to 32 EFPY. The 32 EFPY P-T limit curves were submitted to and approved by the NRC for use at BSEP in a Safety Evaluation Report provided in NRC letter (B. Mozafari) to BSEP (J. Keenan) dated June 18, 2003: “Brunswick Steam Electric Plant, Units 1 and 2, Issuance of Amendment re: Pressure-Temperature Limit Curves (TAC Nos. MB5579 and MB5580).”

Section 3.4 of the NRC Safety Evaluation Report states:

> *This plant-specific benchmark is the most relevant and indicates that the W methodology satisfies the RG 1.190 guidelines, and is acceptable for BSEP plant-specific applications. Because W used a qualified methodology, the calculated fluence values for 32 EFPY are acceptable.*

While the P-T limit curves were based on 32 EFPY fluence projections, validation of the fluence methodology by the NRC also applies to the 54 EFPY fluence projections, because they are further extensions of the same analysis, and have the same basis.

The W fluence evaluation considers the effects of EPU and is projected for 54 EFPY. Therefore, the neutron fluence has been projected to the end of the period of extended operation using a methodology previously reviewed and approved by the NRC. The 54 EFPY fluence projections will be used for evaluating fluence-based TLAAs for BSEP License Renewal.

Disposition: 10 CFR 54.21(c)(1)(ii) – The neutron fluence analyses have been projected to the end of the period of extended operation.

4.2.2 UPPER SHELF ENERGY EVALUATION

4.2.2.1 Reactor Vessel Plates and Welds

Summary Description

Upper-shelf energy (USE) is the standard industry parameter used to indicate the maximum toughness of a material at high temperature. 10 CFR 50, Appendix G, requires that the upper shelf Charpy V-notch energy of the reactor vessel beltline region be greater than 75 ft-lbs initially, and remain above 50 ft-lbs throughout the operating license of the plant. However, the Charpy tests performed on BSEP reactor vessel materials under the code of record provided limited Charpy impact data. It was not possible to develop original Charpy impact test USE values using the ASME III NB-2300, Summer 1972 (and later) methods invoked by 10 CFR 50 Appendix G. Since this minimum requirement is not achieved, a licensee is required to demonstrate that lower values of USE will provide margins of safety against fracture equivalent to those required by the ASME Code Section XI, Appendix G.

For plates and welds, end-of-life fracture energy was evaluated during the current license period by using the equivalent margin analysis (EMA) methodology described in NEDO-32205-A. This methodology was approved by the NRC as documented in a letter from the BWR Owners' Group (L. England) to the USNRC (D. McDonald), dated March 24, 1994: "BWR Owners' Group Topical Report on Upper Shelf Energy Equivalent Margin Analysis – Approved Version," BWROG-94037, (Accession No 94038280161). This analysis confirmed that an adequate margin of safety against fracture, equivalent to 10 CFR 50 Appendix G requirements, does exist. The end-of-life upper-shelf energy calculations satisfy the criteria of 10 CFR 54.3(a). Since these calculations are based upon 40-year fluence values, they are TLAAs.

Analysis

Sixty-year fluence values were calculated for BSEP Units 1 and 2 using the NRC-approved methodology discussed in Subsection 4.2.1 above. Peak fluence values were first calculated at the vessel inner surface (inner diameter). However, for purposes of evaluating USE for 60 years within this calculation, the value of neutron fluence was also calculated for the ¼T location into the vessel wall measured radially from the inside diameter (ID), using Equation 3 from Paragraph 1.1 of Regulatory Guide 1.99, Revision 2. This ¼T depth is recommended in the ASME Boiler and Pressure Vessel Code

Section XI, Appendix G, 1998 Edition, Addendum 2000, Sub-article G-2120, as the maximum postulated defect depth.

BWRVIP-74-A, "BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal," June, 2003, performs a generic analysis and determines that the percent reduction in Charpy USE acceptable for the limiting BWR/3-6 plates and BWR/2-6 welds are 23.5% and 39% respectively. BWRVIP-74-A has been approved by the NRC for use in License Renewal.

The USE values for BSEP materials were evaluated by an EMA using the 54 EFPY calculated fluence and BSEP surveillance capsule results. The results of the EMA for limiting plates and welds on the reactor vessels are shown on Table 4.2-1 and 4.2-2 for Unit 1 and Table 4.2-3 and 4.2-4 for Unit 2. The results are also compared to the limits from BWRVIP-74-A. The results show that the limiting Charpy USE EMA percent reduction is less than the BWRVIP-74-A acceptance criteria in all cases.

Therefore, a 60-year USE EMA for BSEP plates and welds has been prepared using a methodology previously reviewed and approved by the NRC, and the results meet the applicable acceptance criteria in all cases. Thus, the USE values for plates and welds have been satisfactorily projected through the end of the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(ii) – The USE analyses for RPV plates and welds have been projected to the end of the period of extended operation.

4.2.2.2 Reactor Vessel Nozzle Forgings

Summary Description

In its response to Generic Letter 92-01, Revision 1, Supplement 1, dated November 16, 1995, BSEP committed to provide a plant-specific upper shelf energy (USE) equivalent margins analysis for each of the BSEP reactor pressure vessel N16 forged nozzles. Each reactor vessel contains two 2-inch nominal pipe size forged instrument nozzles, N16A and N16B, within the upper beltline region. BSEP performed a plant-specific equivalent margin analysis as required by 10 CFR 50, Appendix G. The analysis showed that the N16 nozzles for both reactor vessels should have had an initial, unirradiated USE (UUSE) of at least 70 ft-lbs, based on an extensive database search. In addition, the USE was not anticipated to drop more than 18% for either reactor vessel, based upon a conservative projection of the end-of-life fluence of 1.6E+18 n/cm^2. Therefore, the end-of-life USE of the nozzles for both vessels was anticipated to remain higher than the minimum screening criterion of 50 ft-lbs.

For added conservatism, an equivalent margins analysis (EMA) was also performed per the guidelines provided in USNRC Regulatory Guide 1.161. This analysis demonstrated that the N16 nozzles would meet the ASME Code, Section XI, Appendix

K, and Regulatory Guide 1.161 J-R fracture toughness requirements with an end-of-life USE as low as 29 ft-lbs. It was also shown that a 29 ft-lb end-of-life USE value would be equivalent to an initial USE of 35 ft-lbs, conservatively assuming the 18% drop in USE over the life of the vessels. As noted above, it has been shown that the subject nozzle material should have an initial USE of at least 70 ft-lbs.

On October 16, 1998, the NRC provided its Safety Evaluation. Refer to NRC letter (D. Trimble) to BSEP (J. Keenan), dated October 16, 1998: "Evaluation of the January 17, 1992, Operating Transient at the Brunswick Steam Electric Plant, Unit 1, and Evaluation of Carolina Power & Light Company's Equivalent Margins Analysis of the N-16A/B Instrument Nozzles at the Brunswick Steam Electric Plant, Units 1 and 2 (TAC Nos. MA0399/400)."

The NRC staff concluded the following:

> *The staff has determined that CP&L's USE evaluation of the No. N-16NA/B instrument nozzles represents a sufficiently conservative assessment of the fracture toughness properties of the nozzles. CP&L's assessment indicates that USE of the nozzles will not fall below the 50 ft-lb value required by the rule at the EOL for the plants. However, since the UUSE for the nozzles has been estimated in the case, CP&L has shown the instrument nozzles should have sufficient protection against ductile tearing, down to a value of 29 ft-lbs. By the staff's calculations, the nozzles should have sufficient margin down to at least a value of 30 ft-lb. These values are not statistically different. The EMAs for the nozzles therefore indicate that even if the EOL USE were lower than the 50 ft-lbs required by the rule, the nozzles have sufficient margin against fracture at USE values lower than those required by the rule, and that the nozzles therefore satisfy the EMA criteria stated in 10 CFR Part 50, Appendix G. Therefore, the staff concludes that CP&L's method for establishing the UUSE and EOL USE values (70 ft-lb and 57.4 ft-lb, respectively) for the nozzle forgings, when coupled with the results of CP&L's EMA for the nozzle forgings, is sufficiently conservative in this case, and therefore, is acceptable.*

Since the equivalent margins analysis for the nozzle forgings was based upon a fluence value assumed for 40 years of operation, the analysis is considered to be a TLAA requiring evaluation for 60 years.

Analysis

The 60-year fluence calculation, discussed in Subsection 4.2.1 above, provides a predicted end-of-life fluence for the N16 nozzles of 1.38E+18 n/cm^2 for 54 EFPY. This 60-year value is below the value of 1.6E+18 n/cm^2 used in the equivalent margin analysis for the N16 nozzles that has already been reviewed and approved by the NRC.

Therefore, the USE equivalent margin analysis for the N16 nozzle forgings has been demonstrated to remain valid for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(i) – The USE equivalent margins analyses for the RPV nozzle forgings remain valid through the end of the period of extended operation.

4.2.3 ADJUSTED REFERENCE TEMPERATURE (ART) ANALYSIS

10 CFR 50, Appendix G specifies fracture toughness requirements for ferritic materials of pressure-retaining components within the beltline region of the reactor coolant pressure boundary. This provides adequate margins of safety during any condition of normal operation to which the pressure boundary may be subjected over its service lifetime, including anticipated operational occurrences and system hydrostatic tests. The requirements of Appendix G apply to the reactor vessel beltline materials. For each BSEP unit, the N16 nozzle forgings are included within the beltline region. The adjusted reference temperature (ART) must account for the effects of neutron irradiation for the expected lifetime of the plant.

10 CFR 50 Appendix G requires the initial unirradiated nil ductility temperature, $RT_{NDT(U)}$ to be evaluated according to the procedures in ASME Section III, Paragraph NB-2331, which require drop-weight testing. However, many older plants, BSEP among them, were built while the ASME Code requirements were still evolving. For BSEP, not all of the tests required to determine the initial unirradiated RT_{NDT} per the present version of the Code were performed. Therefore, estimation methods were developed which could be used to determine the initial $RT_{NDT(U)}$ using the available test data in the same terms as the new requirements. The BSEP response to Generic Letter 92-05, Revision 1, Supplement 1, indicated the following estimation methods that were used to determine initial RT_{NDT} values for BSEP beltline materials: (1) Branch Technical Position MTEB 5-2, Estimation Method No. 4, (2) General Electric estimation procedure, and (3) the testing of archive material.

Analysis

The BSEP reactor vessels were designed for a 40-year life with an assumed neutron exposure of less than 1.0E+19 n/cm^2 from energies exceeding 1.0 MeV. The current licensing basis calculations use realistic calculated fluence values that are lower than this limiting value. The design basis value of 1.0E+19 n/cm^2 bounds calculated fluence values for the original 40-year term for both units.

For License Renewal, the 54 EFPY fluence values at the ¼T location have been used to determine the 60-year ART values for each beltline material, as shown in Table 4.2-5 for Unit 1, and in Table 4.2-6 for Unit 2. The same initial nil-ductility transition temperatures submitted in the BSEP response to Generic Letter 92-05, Revision 1, Supplement 1, were used in the License Renewal ART calculations, except that a new value was estimated for the Girth Weld FG using the General Electric estimation method. The 60-year ART value was computed by determining the initial $RT_{NDT(U)}$ for the unirradiated material and then determining the shift due to irradiation effects, ΔRT_{NDT}, which is added to the initial value. A margin term is added to account for uncertainties, resulting in the upper bound value for ART.

The ART analyses for BSEP Unit 1 and Unit 2 have been projected to the end of the period of extended operation using Method (ii) from 10 CFR 54.21(c)(1). The 60-year ART values for BSEP Unit 1 and Unit 2 were determined, and the results for the limiting component (highest ART value) in each unit are shown below, along with the corresponding inside surface fluence and ¼T fluence. The ART values were used in Subsection 4.2.4 to determine Operating Pressure-Temperature Limits for the RPV.

Parameter	Unit 1 Limiting Component	Unit 2 Limiting Component
	Plate B8496-1	N16 Nozzle forging heat Q2Q1VW
Inside surface fluence (n/cm^2) (E>1.0 MeV)	4.00E+18	1.38E+18
¼T Fluence (n/cm^2) (E>1.0 MeV)	2.86E+18	0.99E+18
¼T ART (°F)	136.1	125.1

Disposition: 10 CFR 54.21(c)(1)(ii) – The ART analyses have been projected to the end of the period of extended operation.

4.2.4 RPV OPERATING PRESSURE-TEMPERATURE (P-T) LIMITS

Summary Description

The Adjusted Reference Temperature (ART) is the value of Initial RT_{NDT} + ΔRT_{NDT} + margins for uncertainties at a specific location. Neutron embrittlement increases the ART. Thus, the minimum temperature at which a reactor vessel is allowed to be pressurized increases over the licensed period. The ART of the limiting beltline material is used to correct the beltline operating Pressure-Temperature (P-T) limits to account for irradiation effect.

10 CFR Part 50 Appendix G requires reactor vessel thermal limit analyses to determine operating pressure-temperature (P-T) limits for boltup, hydrotest, pressure tests and normal operating and anticipated operational occurrences. Operating limits for pressure and temperature are required for three categories of operation: 1) hydrostatic pressure tests and leak tests, non-nuclear heat-up/cooldown and low level physics tests, and core critical operation.

The calculations associated with generation of the P-T curves satisfy the criteria of 10 CFR 54.3(a). As such, this topic is a TLAA.

Analysis

The BSEP Technical Specifications contain P-T limit curves for heatup, cooldown, and in-service leakage and hydrostatic testing and also limit the maximum rate of change of reactor coolant temperature. The criticality curves provide limits for both heat-up and criticality calculated for a 32 EFPY operating period. Because of the relationship between the P-T limits and the fracture toughness transition of the reactor vessel, BSEP will require new P-T limits to be calculated.

P-T limit curves applicable for BSEP Units 1 and 2 for 60 years have been developed based upon the 54 EFPY fluence projections discussed in Subsection 4.2.1. These curves were developed to account for the increased fluence associated with the period of extended operation, and show that adequate operating margins will exist when they are used.

Disposition: 10 CFR 54.21(c)(1)(ii) – The P-T limit analyses have been projected to the end of the period of extended operation.

4.2.5 RPV CIRCUMFERENTIAL WELD EXAMINATION RELIEF

Summary Description

The Boiling Water Reactor Vessel and Internals Project (BWRVIP) submitted a report that proposed to reduce the scope of inspection of BWR RPV welds from essentially 100 percent of all RPV shell welds to examination of essentially 100 percent of the axial (longitudinal) welds and essentially none of the circumferential RPV shell welds, except at the intersection of the axial and circumferential welds, thereby including approximately 2-3 percent of the circumferential welds. The report provided proposals to revise ASME Code requirements for successive and additional examinations of circumferential welds, provided in paragraph IWB-2420(b) of Section XI of the ASME Code.

The NRC staff issued a Safety Evaluation Report by NRC letter (G. Lainas) to the BWRVIP (C. Terry), dated July 28, 1998: “Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report (TAC No. M93925).” This evaluation concluded that the failure frequency of RPV circumferential welds in BWR reactors was sufficiently low to justify elimination of inservice inspection (ISI) of these welds. In addition, the evaluation concluded that BWRVIP proposals on successive and additional examinations of circumferential welds were acceptable. The evaluation indicated that examination of the circumferential welds shall be performed if axial weld examinations reveal an active, mechanistic mode of degradation. A supplemental Safety Evaluation Report was provided on March 7, 2000.

On November 10, 1998, the NRC issued Generic Letter 98-05, “Boiling Water Reactor Licensees Use of the BWRVIP-05 Report to Request Relief from Augmented Examination Requirements on RPV Shell Welds.” GL 98-05 stated that BWR licensees may request permanent relief (for the remaining term of operation under the existing license) from ISI requirements of 10 CFR 50.55a(g) for the volumetric examination of circumferential RPV welds (ASME Code Section XI, Table IWB-2500-l, Examination Category B-A, Item 1.11, “Circumferential Shell Welds”), upon demonstrating that:

1. the limiting conditional failure probability for circumferential welds satisfies the values specified in the NRC staff’s July 28, 1998, Safety Evaluation Report; and
2. licensees have implemented operator training and established procedures that limit the frequency of cold overpressure events to the amount specified in the NRC staff’s July 28, 1998, Safety Evaluation Report.

Licensees would still need to perform the required inspections of “essentially 100 percent” of all axial welds.

BSEP submitted a request for relief and has received this relief for the remaining licensed operating period. The circumferential weld examination relief analysis meets the requirements of 10 CFR 54.3(a) and is a TLAA.

Analysis

The NRC evaluation of BWRVIP-05 utilized a probabilistic fracture mechanics (PFM) analysis to estimate the RPV shell weld failure probabilities. Three key assumptions of the PFM analysis are:

1. the neutron fluence was the estimated end-of-life mean fluence
2. the chemistry values are mean values based on vessel types, and
3. the potential for beyond-design-basis events is considered.

Table 4.2-7 provides a comparison of the BSEP Units 1 and 2 reactor vessel limiting circumferential weld parameters to those used in the NRC evaluation for the first two key assumptions. Data provided in Table 4.2-7 was supplied from Tables 2.6-4 and 2.6-5 of the previously identified, July 28, 1998 NRC Safety Evaluation Report. However, the correction of the Chemistry Factor in the table is from the supplement to the SER issued by the NRC on March 7, 2000.

The 54 EFPY fluence values for BSEP are bounded by both the 32 EFPY and 64 EFPY fluence values in the NRC analysis. The BSEP Units 1 and 2 weld materials have lower copper and nickel values than those used in the NRC analysis. Hence, there is a smaller chemistry factor. As a result, the shifts in reference temperature for Units 1 and

2 are lower than both the 32 EFPY and 64 EFPY shift from the NRC SER analysis. The combination of unirradiated reference temperature ($RT_{NDT(U)}$) and shift (ΔRT_{NDT}) yields adjusted reference temperatures for Units 1 and 2 that are considerably lower than the NRC mean analysis values. Therefore, the RPV shell weld embrittlement due to the additional fluence associated with the period of extended operation has a negligible effect on the probabilities of RPV shell weld failure. The Mean RT_{NDT} values for Units 1 and 2 at 54 EFPY are bounded by the 32 EFPY and the 64 EFPY Mean RT_{NDT} provided by the NRC.

Although a conditional failure probability has not been calculated, the fact that the BSEP values for Mean RT_{NDT} at the end of the 60-year license are less than both the 32 EFPY and 64 EFPY values provided by the NRC leads to the conclusion that the BSEP RPV conditional failure probability is bounded by the NRC analysis. Therefore, the TLAA has been projected through the end of the period of extended operation.

The procedures and training used to limit cold over-pressure events during the period of extended operation will be the same as those approved by the NRC when BSEP requested that the BWRVIP-05 technical alternative be used for the current licensing term for Units 1 and 2.

Disposition: 10 CFR 54.21(c)(1)(ii) – The RPV circumferential weld analyses have been projected to the end of the period of extended operation.

4.2.6 RPV AXIAL WELD FAILURE PROBABILITY

Summary Description

In order to gain RPV Circumferential Weld Examination Relief as discussed in the previous subsection, it was required to demonstrate that the <u>axial</u> weld failure rate is no more than 5 x 10^{-6} per reactor-year. BWRVIP-05 showed that this axial weld failure rate of 5 x 10^{-6} per reactor-year is orders of magnitude greater than the 40-year end-of-life circumferential weld failure probability, and used this analysis to justify relief from inspection of the circumferential welds. As discussed in the previous Subsection, BSEP Units 1 and 2 received relief from the circumferential weld inspections for the remainder of their 40 year licensed operating period. The axial weld failure probability analysis meets the requirements of 10 CFR 54.3(a). As such, it is a TLAA.

Analysis

As stated in the previous Subsection, BSEP Units 1 and 2 received NRC approval for a technical alternative which eliminated the reactor vessel circumferential shell weld inspections for the current license term. The basis for this relief request was an analysis that satisfied the limiting conditional failure probability for the circumferential welds at the expiration of the current license based on BWRVIP-05 and the extent of neutron embrittlement. The NRC SER associated with BWRVIP-05 concluded that the reactor vessel failure frequency due to failure of the limiting axial welds in the BWR fleet at the end of 40 years of operation is less than 5 x 10^{-6} per reactor-year. This failure frequency is dependent upon given assumptions of flaw density, distribution, and location. The failure frequency also assumes that “essentially 100%” of the reactor vessel axial welds will be inspected. The anticipated changes in metallurgical conditions expected over the extended licensed operating period require an additional analysis for the period of extended operation and approval by the NRC to extend the reactor vessel circumferential weld inspection relief request.

Table 4.2-8 compares the limiting axial weld 54 EFPY properties for BSEP Units 1 and 2 against the values taken from Table 3 found in the supplement to the NRC SER for BWRVIP-05. The SER supplement required the limiting axial weld to be compared with data found in Table 3. The supplemental SER states:

> *A third calculation, with an initial RT_{NDT} of -2 °F and a mean RT_{NDT} of 114 °F, was chosen to identify the mean value of RT_{NDT} required to provide a result which closely matches the RPV failure frequency of 5 x 10^{-6} per reactor-year.*

The BSEP evaluation is therefore performed using data from “Mod 2” of Table 3 of the supplement. The limiting axial welds at BSEP Units 1 and 2 are all welds with similar chemistry. As shown in Table 4.2-8, the limiting weld chemistry, chemistry factor, and 54 EFPY mean RT_{NDT} values are within the limits of the values assumed in the analysis performed by the NRC staff in the BWRVIP-05 SER supplement. Thus, the probability of failure for the axial welds is bounded by the NRC evaluation.

Therefore, this TLAA has been demonstrated to remain valid for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(ii) – The RPV axial weld analyses have been projected to the end of the period of extended operation.

4.2.7 CORE SHROUD REFLOOD THERMAL SHOCK ANALYSIS

Summary Description

Section 3.9.2.5 of the BSEP USFAR includes an end-of-life (40-year) thermal shock analysis performed for the core shroud for a design basis loss-of-coolant accident (LOCA) followed by a low-pressure coolant injection. The reflood shock refers to the stress imposed upon the shroud due to contact between the hot shroud and the cold water injected to reflood the vessel. The ability of the shroud to withstand this shock was determined by comparing the amount of strain that would be imposed by the shock loading to the amount of strain the material could withstand, using material property values that would be expected after 40 years of radiation exposure. Since the material properties were based upon 40-year fluence values, they meet the requirements of 10 CFR 54.3(a). As such, the analysis based upon these properties is a TLAA.

The current analysis states:

> *The most irradiated point on the inner surface of the shroud is subjected to a total integrated neutron flux of 6.2 x 10^{20} nvt (>1.0 MeV) by the end of plant life. The peak thermal shock stress is 155,700 psi, corresponding to a peak strain of 0.57 percent. The shroud material is Type 304 stainless steel. Data for irradiated stainless steel at higher flux levels show the material will strain to 50 percent before failure. Therefore, the peak strain resulting from thermal shock at the inside of the shroud represents no loss of integrity of the reactor vessel inner volume.*

Analysis

As discussed above, core shroud components were evaluated for a reflood thermal shock event, considering the embrittlement effects of lifetime radiation exposure. The analysis includes the most irradiated point on the inner surface of the shroud where the calculated value of fluence for 40-year operating period is below the threshold (6.2E+20 n/cm^2) for material property changes due to irradiation. However, using the approved fluence methodology discussed in Subsection 4.2.1, the 54 EFPY fluence at the most irradiated point on the core shroud was calculated to be 4.17E+21 n/cm^2.

The peak strain of 0.57% represents a considerable margin of safety below measured values of percent elongation for annealed Type 304 stainless steel irradiated to 8.0E+21 n/cm^2 (neutrons with energy level E >1.0 Million electron Volts). The measured value of percent elongation for stainless steel weld metal is 4% for a temperature of 297°C (567°F) with a neutron flux of 8.0E+21 n/cm^2 (E >1.0 MeV), while the average value for base metal at 290°C (554°F) is 20% based on values provided in BWRVIP-35. Since the 54 EFPY fluence at the most irradiated point on the core shroud was calculated to be less than 8.0E+21n/cm^2 (E >1.0 MeV), the thermal shock effects on the shroud at the point of highest irradiation level will not jeopardize the proper functioning of the shroud following the design basis accident during the period of extended operation.

Therefore, this TLAA has been demonstrated to remain valid for the period of extended operation.

Disposition: **10 CFR 54.21(c)(1)(ii) – The core shroud reflood thermal shock analyses have been projected to the end of the period of extended operation.**

4.2.8 CORE PLATE PLUG SPRING STRESS RELAXATION

Summary Description

In the mid-1970s, mechanical-type core plate plugs were installed in the bypass flow holes of the core support plates of various BWR/4s. The plugs were intended to limit flow through bypass flow holes and reduce flow-induced vibration of in-core neutron monitors and start-up sources against the corners of the fuel assemblies. The spring-loaded plugs were designed to withstand typical and worst-case transient differential pressures. Brunswick Unit 2 has installed these mechanical plugs. The Alloy X-750 spring that provides preload to the core plate plug will relax as a function of thermal and neutron exposure. The loss of preload may cause the plug to leak at a higher rate than the design value, producing possible flow induced vibration effects that can influence other components in the core. It should be noted that Brunswick Unit 1 does not have the mechanical plugs, but has welded plugs which do not have the springs subject to this aging effect.

The projected relaxation is based upon 40-year fluence values, although it was only shown to be valid for up to 24 EFPY. It has been conservatively determined to be a TLAA, and will be evaluated as such in accordance with 10 CFR 54.3(a).

Analysis

Since the spring relaxation would exceed acceptable limits if exposed to a 54 EFPY fluence value, projecting the analysis for 60 years is not feasible. Therefore, loss of pre-load due to stress relaxation of the core plate plug spring will be managed by the Reactor Vessel and Internals Structural Integrity Program.

Disposition **10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) of the core plate plug springs will be adequately managed for the period of extended operation.**

4.2.9 CORE SHROUD REPAIR HARDWARE ANALYSIS

Summary Description

In 1994, twelve bolted clamps were installed on the BSEP Unit 1 core shroud to structurally replace the H2 and H3 horizontal welds due to the cracking that had been discovered in these welds. Identical clamps were subsequently installed on the Unit 2 core shroud. The repair hardware is subject to loss of material properties due to neutron irradiation. The hardware design accounted for material property loss through the end of the current 40-year license period.

The purpose of the repair hardware is to structurally replace the H2 and H3 welds at the upper end of the core shroud. Twelve repair bracket assemblies were spaced equally around the circumference of the shroud (i.e. one every 30° of circumference). The top guide support ring is "straddled" by the repair block fixture, and the upper and lower shroud assemblies are effectively "clamped" together. A repair bracket consists of a block that is bolted to the lower shroud by two stepped bolts. The block is also bolted to the upper shroud by two additional stepped bolts. Washers are used at each of the upper bolt locations to ensure intimate contact occurs as a result of bolt preload between the contacting surfaces of the repair bracket and the shroud.

Analysis

The design specification for the repair hardware specifies that the maximum neutron radiation flux at the shroud repair clamp is 1.0 E13 neutrons/ cm^2-sec. It also specifies that the shroud repair clamps shall be designed for a life of 23 years, which was equal to the remaining portion of the 40-year design life of the plant. The cumulative neutron fluence for the design life of the clamp equals the flux multiplied by the time. This results in a design fluence of 7.26E+21 n/cm^2.

The neutron fluence calculation discussed in Subsection 4.2.1 includes fluence projections applicable for the reactor vessel and internals for the current operating term and at 54 EFPY, which bounds 60 years of operation. The calculation includes fluence projections for the reactor pressure vessel and for the core shroud. Separate projections were included for each of the horizontal core shroud welds, which are numbered from H1 at the top of the shroud through H7 near the bottom. The core shroud repair clamps are located in the region of welds H2 and H3. Weld H4 is located approximately 3 feet below these welds, and is nearer the active core of the vessel. Therefore, the H4 location is exposed to higher neutron fluence values than the H2 and H3 welds nearest the clamps. The peak fluence values for the H4 welds were selected as bounding fluence values for the shroud repair brackets. The following data were obtained for the H4 weld locations in each Unit:

Peak Unit 1 54 EFPY Fluence at the H4 Weld location = <u>4.16E+21 n/cm^2</u>
Peak Unit 2 54 EFPY Fluence at the H4 Weld location = <u>4.17E+21 n/cm^2</u>

Therefore, the derived design end-of-life fluence value of 7.26E+21 n/cm^2 bounds both the Unit 1 peak fluence value of 4.16E+21 n/cm^2 and the Unit 2 peak fluence value of 4.17E+21 n/cm^2 with considerable margin. Therefore, the core shroud repair hardware analysis remains valid since the hardware design accounted for material property loss resulting from neutron exposure that bounds the neutron exposure projected for the 60-year extended operating period.

Disposition: 10 CFR 54.21(c)(1)(i) – The core shroud repair hardware analyses remain valid through the end of the period of extended operation.

TABLE 4.2-1 54 EFPY USE EQUIVALENT MARGINS ANALYSIS FOR BSEP UNIT 1 PLATE MATERIALS

Equivalent Margin Analysis
Plant Applicability Verification Form
for Brunswick Unit 1
60 Year Life (54EFPY)

BWR/3-6 Plate

Surveillance Plate USE (Heat C4487-1):

% Cu	=	0.12	
1st Capsule Fluence	=	3.2E+17 n/cm^2	
1st Capsule Measured % Decrease	=	N/A	(Charpy Curves)
1st Capsule RG 1.99 Predicted % Decrease	=	9.5	(RG 1.99, Rev. 2, Figure 2)

Limiting Beltline Plate USE (Heat B8496-1):

% Cu	=	0.19	
54 EFPY ¼T Fluence	=	2.86E+18 n/cm^2	
RG 1.99 Predicted % Decrease	=	21.0	(RG 1.99, Rev. 2, Figure 2)
Adjusted % Decrease	=	N/A	(RG 1.99, Rev. 2, Position 2.2)

21.0% ≤ 23.5%

Therefore, the vessel plates are bounded by the BWRVIP-74-A equivalent margin analysis.

TABLE 4.2-2 54 EFPY USE EQUIVALENT MARGINS ANALYSIS FOR BSEP UNIT 1 WELD MATERIALS

Equivalent Margin Analysis
Plant Applicability Verification Form
for Brunswick Unit 1
60 Year Life (54EFPY)

BWR/2-6 Weld

Surveillance Weld USE (Heat S3986):

% Cu	=	0.055	
1st Capsule Fluence	=	3.2E+17 n/cm^2	
1st Capsule Measured % Decrease	=	N/A	(Charpy Curves)
1st Capsule RG 1.99 Predicted % Decrease	=	8.6	(RG 1.99, Rev. 2, Figure 2)

Limiting Beltline Weld USE (Heat 1P4218):

% Cu	=	0.06	
54 EFPY ¼T Fluence	=	2.32E+18 n/cm^2	
RG 1.99 Predicted % Decrease	=	14.1	(RG 1.99, Rev. 2, Figure 2)
Adjusted % Decrease	=	N/A	(RG 1.99, Rev. 2, Position 2.2)

14.1% ≤ 39.0%

Therefore, the vessel welds are bounded by the BWRVIP-74-A equivalent margin analysis.

TABLE 4.2-3 54 EFPY USE EQUIVALENT MARGINS ANALYSIS FOR BSEP UNIT 2 PLATE MATERIALS

Equivalent Margin Analysis
Plant Applicability Verification Form
for Brunswick Unit 2
60 Year Life (54EFPY)

BWR/3-6 Plate

Surveillance Plate USE (Heat C4489-1):

% Cu	=	0.12	
1st Capsule Fluence	=	4.06E+17 n/cm^2	
1st Capsule Measured % Decrease	=	N/A	(Charpy Curves)
1st Capsule RG 1.99 Predicted % Decrease	=	10.0	(RG 1.99, Rev. 2, Figure 2)

Limiting Beltline Plate USE (Heat C4500-2):

% Cu	=	0.15	
54 EFPY ¼T Fluence	=	2.31E+18 n/cm^2	
RG 1.99 Predicted % Decrease	=	17.0	(RG 1.99, Rev. 2, Figure 2)
Adjusted % Decrease	=	N/A	(RG 1.99, Rev. 2, Position 2.2)

17.0% ≤ 23.5%

Therefore, the vessel plates are bounded by the BWRVIP-74-A equivalent margin analysis.

TABLE 4.2-4 54 EFPY USE EQUIVALENT MARGINS ANALYSIS FOR BSEP UNIT 2 WELD MATERIALS

Equivalent Margin Analysis Plant Applicability Verification Form for Brunswick Unit 2 60 Year Life (54EFPY) BWR/2-6 Weld			
Surveillance Weld USE (Heat Unknown)☹Note 1)			
% Cu	=	0.183	
1st Capsule Fluence	=	4.06E+17 n/cm^2	
1st Capsule Measured % Decrease	=	N/A	(Charpy Curves)
1st Capsule RG 1.99 Predicted % Decrease	=	15.5	(RG 1.99, Rev. 2, Figure 2)
Limiting Beltline Weld USE (Heat S3986):			
% Cu	=	0.06	
54 EFPY ¼T Fluence	=	1.80E+18 n/cm^2	
RG 1.99 Predicted % Decrease	=	13.3	(RG 1.99, Rev. 2, Figure 2)
Adjusted % Decrease	=	N/A	(RG 1.99, Rev. 2, Position 2.2)
		13.3% ≤	39.0%
Therefore, the vessel welds are bounded by the BWRVIP-74-A equivalent margin analysis.			

Notes:

1. In accordance with the report submitted by letter BSEP 97-0051, dated February 25, 1997, “Analysis of the 300 Deg Capsule from the Carolina Power and Light Company Brunswick Unit 2 Reactor Vessel Radiation Surveillance Program,” no weld heat number could be conclusively identified.

TABLE 4.2-5 54 EFPY ADJUSTED REFERENCE TEMPERATURES FOR BSEP UNIT 1 MATERIALS

							¼T Values						
Component	Heat or Heat/Lot	%Cu	%Ni	CF	Initial RT_{NDT} °F	ID Fluence x 1.0E+18 n/cm^2	Fluence x 1.0E+18 n/cm^2	54 EFPY ΔRT_{NDT} °F	σ_I	σ_Δ	Margin °F	Shift °F (ΔRT_{NDT} + Margin)	ART °F (Initial RT_{NDT} + Shift)
Plates:													
Lower Shell													
	C4535-2	0.12	0.58	83	34	3.24	2.32	50.0	0	17.0	34.0	84.0	118.0
	C4550-1	0.11	0.60	74	10	3.24	2.32	44.8	0	17.0	34.0	78.8	88.8
Lower Intermediate Shell													
	C4487-1	0.12	0.56	82	10	4.00	2.86	54.1	0	17.0	34.0	88.1	98.1
	B8496-1	0.19	0.58	140	10	4.00	2.86	92.1	0	17.0	34.0	126.1	136.1
Welds:													
Vertical													
G1, G2	S3986	0.05	0.96	68	10	2.07	1.48	34.0	0	17.0	34.0	68.0	78.0
F1, F2	S3986	0.05	0.96	68	10	2.56	1.83	37.3	0	18.7	37.3	74.6	84.6
Girth													
EF	S3986	0.05	0.96	68	10	0.32	0.23	12.6	0	6.3	12.6	25.3	35.3
FG	1P4218	0.06	0.87	82	-50 [1]	3.24	2.32	49.7	0	24.8	49.7	99.3	49.3
Nozzles:													
N16A, N16B	Q2Q1VW	0.16	0.82	123	48	1.38	0.99	51.1	0	17.0	34.0	85.1	133.1

Note 1. The Initial (unirradiated) reference temperature ($RT_{NDT(U)}$) is based on using the General Electric Methodology that was approved by NRC letter (B. Sheron) to BWROG (R. Pinelli), dated December 16, 1994: "Safety Assessment of Report NEDC-32399-P, Basis for GE RT_{NDT} Estimation Method."

TABLE 4.2-6 54 EFPY ADJUSTED REFERENCE TEMPERATURES FOR BSEP UNIT 2 MATERIALS

							¼T Values						
Component	Heat or Heat/Lot	%Cu	%Ni	CF	Initial RT_{NDT} °F	ID Fluence 1.0E+18 n/cm^2	Fluence 1.0E+18 n/cm^2	54 EFPY ΔRT_{NDT} °F	σ_I	σ_Δ	Margin °F	Shift °F (ΔRT_{NDT} + Margin)	ART °F (Initial RT_{NDT} + Shift)
Plates:													
Lower Shell													
	C4500-2	0.15	0.54	107	10	3.22	2.31	64.4	0	17.0	34.0	98.4	108.4
	C4550-2	0.11	0.60	74	10	3.22	2.31	44.7	0	17.0	34.0	78.7	88.7
Lower Intermediate Shell													
	C4489-1	0.12	0.60	83	10	3.98	2.85	54.5	0	17.0	34.0	88.5	98.5
	C4521-2	0.12	0.57	82	10	3.98	2.85	54.2	0	17.0	34.0	88.2	98.2
Welds:													
Vertical Welds													
G1, G2	S3986	0.05	0.96	68	10	2.04	1.46	33.8	0	16.9	33.8	67.6	77.6
F1, F2	S3986	0.05	0.96	68	10	2.51	1.80	37.0	0	18.5	37.0	74.0	84.0
Girth													
EF	S3986	0.05	0.96	68	10	0.32	0.23	12.6	0	6.3	12.6	25.2	35.2
FG	3P4000	0.02	0.90	27	-50 (1)	3.22	2.31	16.3	0	8.2	16.3	32.6	-17.4
Nozzles:													
N16A, N16B	Q2Q1VW	0.16	0.82	123	40	1.38	0.99	51.1	0	17.0	34.0	85.1	125.1

Note 1. The Initial (unirradiated) reference temperature ($RT_{NDT(U)}$) is based on using the General Electric Methodology that was approved by NRC letter (B. Sheron) to BWROG (R. Pinelli), dated December 16, 1994: “Safety Assessment of Report NEDC-32399-P, Basis for GE RT_{NDT} Estimation Method.”

TABLE 4.2-7 COMPARISON OF BSEP CIRCUMFERENTIAL WELD PARAMETERS TO NRC ANALYSIS PARAMETERS

	BSEP Unit 1 Heat # 1P4218	BSEP Unit 2 Heat # 3P4000	USNRC Limiting Plant-specific Analysis Parameters from Safety Evaluation	
			Table 2.6-4	Table 2.6-5
	54 EFPY	54 EFPY	32 EFPY	64 EFPY
Neutron fluence at the end-of-license (1.0E+19 n/cm^2)	0.324	0.322	0.510	1.020
Initial (unirradiated) reference temperature ($RT_{NDT(U)}$)			-65 °F	-65 °F
o CP&L Values [1]	-50 °F	-50 °F		
o NRC generic value	-56 °F	-56 °F		
Weld chemistry factor (CF)	82.0 °F	27.0 °F	134.9 °F [2]	134.9 °F [2]
Weld copper content	0.06%	0.02%	0.10%	0.10%
Weld nickel content	0.87%	0.90%	0.99%	0.99%
Increase in reference temperature due to irradiation (ΔRT_{NDT})	56.6 °F	18.6 °F	109.5 °F	135.6 °F
Standard deviation of the initial RT_{NDT} (σ_I) [3]	0 °F 17 °F	0 °F 17 °F	N/A	N/A
Standard deviation for ΔRT_{NDT} (σ_Δ) [4]	28 °F	9.30 °F		
Margin term $\left(2\sqrt{\sigma_I^2+\sigma_\Delta^2}\right)$	56.0 °F 65.5 °F	18.6 °F 38.8 °F	56.0 °F	56.0 °F
Mean adjusted reference temperature (Mean ART) = $RT_{NDT(U)} + \Delta RT_{NDT}$	6.6 °F 0.6 °F	-31.4 °F -37.4 °F	44.5 °F	70.6 °F
Upper bound adjusted reference temperature (ART) = $RT_{NDT(U)} + \Delta RT_{NDT}$ + Margin	62.6 °F 66.1 °F	-12.8 °F 1.4 °F	100.5 °F[5]	126.6 °F[6]

Notes:

1. The Initial (unirradiated) reference temperature ($RT_{NDT(U)}$) is based on using the methodology that was approved by the NRC SER for NEDC-32399-P or is the generic value from 10 CFR 50.61.
2. This value for the Chemistry Factor was provided by the NRC staff in a supplement to the original SER to BWRVIP-05 on March 7, 2000.
3. The standard deviation of the initial RT_{NDT} (σ_I) is 0 °F for CP&L data and 17 °F for the NRC Generic Value based on NRC Memo 82.
4. The standard deviation for ΔRT_{NDT} (σ_Δ) is 28 °F, except that it need not exceed 0.50 times the mean value of ΔRT_{NDT}.
5. This value not shown in Table 2.6-4 of NRC Safety Evaluation of BWRVIP-05. This value was calculated from other values taken from the table.
6. This value not shown in Table 2.6-5 of NRC Safety Evaluation of BWRVIP-05. This value was calculated from other values taken from the table.

TABLE 4.2-8 IRRADIATION EFFECTS ON RPV AXIAL WELD PROPERTIES FOR BSEP UNITS 1 AND 2

Value	NRC BWRVIP-05 Supplement of SER "Mod 2"	BSEP Unit 1 54 EFPY	BSEP Unit 1 54 EFPY
Weld copper content	0.219%	0.05%	0.05%
Weld nickel content	0.996%	0.96%	0.96%
Chemistry factor (CF)	232 °F (1)	68 °F	68 °F
Fluence (x 1.0E+19 n/cm^2)	0.148 (2)	0.256	0.252
Increase in reference temperature due to irradiation (ΔRT_{NDT})	116 °F	43 °F	43 °F
Initial (unirradiated) reference temperature ($RT_{NDT(U)}$)	-2 °F	10 °F	10 °F
Mean adjusted reference temperature (Mean ART) $= RT_{NDT(U)} + \Delta RT_{NDT}$	114 °F	53 °F	53 °F
Vessel Failure Frequency (P(F/E))	5.02×10^{-6}	Not Calculated	Not Calculated

Notes:

1. This value is not provided in the supplement to the SER for BWRVIP-05 but has been calculated separately based on the provided copper and nickel contents.
2. This value is the peak axial fluence.

4.3 METAL FATIGUE

Fatigue analyses performed for a number of plant mechanical components have been identified as time-limited aging analyses (TLAAs) for BSEP. These are discussed in the following Subsections.

4.3.1 REACTOR VESSEL FATIGUE ANALYSES

Summary Description

The original Reactor Pressure Vessel (RPV) stress report included fatigue analyses for the reactor vessel components based on a set of design basis duty cycles. The fatigue analyses were prepared in accordance with the ASME B&PV Code, Section III, 1965 Edition, with Addenda through Summer, 1967, for Class A vessels. The fatigue analysis of the reactor vessel main closure flange was performed to the 1968 Edition of the Code.

The list of design transients used in these fatigue analyses was intended to envelope all foreseeable thermal and pressure cycles which could be expected to occur within a nominal 40-year operating period for the plant. The list of transients is shown in Table 4.3-1. Forty-year design Cumulative Usage Factor (CUF) values were determined using the design fatigue strength curves from ASME Section III for the material type used in each component. Table 4.3-2 lists these components and the CUF values from the original stress report. The analyses demonstrated that if the components were exposed to a bounding set of postulated transient cycles, the CUF values for the components would remain below 1.0.

Since the original design, modifications have been made to replace a number of components, resulting in updated fatigue analyses. The safe ends and thermal sleeves for certain RPV nozzles were replaced, including those for the core spray nozzles, the recirculation inlet nozzles, and the feedwater nozzles (Unit 1 only). The RPV nozzle forgings were not replaced. A revised method of tensioning the reactor head closure bolts with fewer passes has also been developed, and a revised fatigue analysis was prepared. Also, a power uprate to 105% of original licensed thermal power (OLTP) was implemented for each BSEP Unit, which increased RPV temperature and pressure, resulting in increased fatigue usage. Revised fatigue analyses were performed on limiting components to account for these modifications and operational changes, and these updated 40-year design CUF values are listed in Table 4.3-2.

Analyses

Sixty-year fatigue usage projections have been made for License Renewal based upon extrapolation of data obtained from the RCPB Fatigue Monitoring Program for limiting components. Originally, fatigue monitoring only tracked the number of occurrences of transients that occurred in the reactor coolant system of each Unit. However, improvements have been made to the RCPB Fatigue Monitoring Program that permit determination of the severity of the transients that actually occur, using a special version of computer software developed for the Electric Power Research Institute. A log of operating parameters from cyclic operations is used to determine the range and rate of temperature and/or pressure change associated with each transient, which is then converted to cumulative fatigue usage. Plant cyclic data have been used to periodically compute the actual fatigue usage (expressed as CUF) to-date for limiting components of each Unit, as shown in Table 4.3-3.

The BSEP UFSAR was revised to change the RCPB Fatigue Monitoring Program licensing basis from a method that compares the number of occurrences of transient cycles to-date to the number originally used in the design fatigue analyses to a method that compares the actual CUF to date to the CUF design limit of 1.0. The list of design cycles used in the initial fatigue analyses is considered historical.

For License Renewal, the results from the computer-based monitoring program were used to predict the fatigue usage expected for 40 years and 60 years of operation using linear extrapolation of the actual fatigue usage that occurred from initial plant startup through 2002, also shown in Table 4.3-3. The trend data shows a declining rate of occurrence of most operational transients, reflective of improving performance over time.

An extended power uprate to 120% OLTP has been recently implemented for each Unit. However, unlike the 105% uprate, the 120% uprate had minimal impact upon fatigue of reactor vessel components since the reactor temperature and pressure were not significantly increased. The feedwater and main steam flow rates increased, leading to a very small increase in fatigue usage for the feedwater nozzles. The 60-year CUF projections for these nozzles account for this effect, as shown in Table 4.3-3.

Based on the results of the 60-year fatigue usage projections summarized above, the fatigue usage factors for limiting components have been projected to remain below the ASME Code allowable of 1.0 for 60 years. The fatigue usage will continue to be monitored during the period of extended operation by the RCPB Fatigue Monitoring Program and the fatigue usage to-date will be periodically compared to the CUF limit of 1.0 to assure this limit is not exceeded.

The effects of the reactor water environment on projected fatigue usage results are evaluated separately in Subsection 4.3.3 below.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation; and
10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

4.3.2 REACTOR VESSEL INTERNALS FATIGUE ANALYSES

The design codes described in Subsection 4.3.1 did not require a fatigue analysis to be performed for non-pressure boundary Reactor Pressure Vessel Internals components. However, the RPV shroud support and RPV internal brackets, which are attached to the pressure-boundary components, were included in the RPV fatigue analyses discussed in Subsection 4.3.1. The shroud support is specifically identified in Table 4.3-2 and the RPV internal brackets are part of the RPV shell, also shown in that table. The fatigue analyses for these components remain valid through the period of extended operation in accordance with the discussion in Subsection 4.3.1. No other fatigue TLAAs were identified for Reactor Pressure Vessel Internal components.

4.3.3 EFFECTS OF REACTOR COOLANT ENVIRONMENT ON FATIGUE LIFE OF COMPONENTS AND PIPING (GENERIC SAFETY ISSUE 190)

Summary Description

Generic Safety Issue (GSI)-190, Fatigue Evaluation of Metal Components for 60-year Plant Life, addresses the fatigue life of metal components and has been closed by the NRC. However, the NRC staff concluded that LR applicants should address the effects of reactor coolant environment on component fatigue life for the period of extended operation.

Analysis

Proposed Interim Staff Guidance document ISG-16, "Time-Limited Aging Analyses (TLAAs) Supporting Information for License Renewal Applications," included guidance for evaluating fatigue for License Renewal applicants. The NRC staff had assessed the impact of the reactor water environment on fatigue life at high fatigue usage locations and presented the results in NUREG/CR-6260, "Application of NUREG/CR-5999, Interim Fatigue Curves to Selected Nuclear Power Plant Components," March, 1995. Formulas currently acceptable to the NRC staff for calculating the environmental fatigue correction factors (F_{en}) for carbon and low-alloy steels are contained in NUREG/CR-6583, “Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels.” Formulas currently acceptable to the NRC staff for calculating F_{en} for austenitic stainless steels are contained in NUREG/CR-5704, “Effects of LWR Coolant Environments on Fatigue Design of Austenitic Stainless Steels.” To address this issue, an LR applicant should provide the results of environmentally assisted fatigue (EAF) adjusted CUF calculations for each of the locations listed in NUREG/CR-6260.

The following six locations were evaluated for environmental fatigue effects in NUREG/CR-6260 for the older vintage GE plant, which represents the same vintage plant as BSEP:

(1) reactor vessel shell and lower head,
(2) reactor vessel feedwater nozzle,
(3) reactor recirculation piping (including the reactor inlet and outlet nozzles),
(4) core spray line reactor vessel nozzle and associated Class 1 piping,
(5) residual heat removal (RHR) return line Class 1 piping, and
(6) feedwater line Class 1 piping.

Plant-specific environmental fatigue calculations were performed for BSEP Units 1 and 2 for each of these locations in accordance with NUREG/CR-6583 for carbon and low alloy steel components and in accordance with NUREG/CR-5704 for stainless steel components. F_{en} multipliers were computed for each location to account for reactor water temperature, oxygen content, strain, and strain rates. Separate F_{en} multipliers were computed for Hydrogen Water Chemistry (HWC) conditions and for Normal Water Chemistry (NWC) conditions to account for the effects of dissolved oxygen on F_{en}, and these values were combined based upon historical HWC operational data and conservative projections of future HWC system operation. Each of the fatigue analyses were adjusted to account for environmental effects by applying the F_{en} multiplier to 60-year CUF projections, as shown in Table 4.3-4.

Items 5 and 6 required new ASME Section III, Class 1 fatigue analyses because they were designed in accordance with USAS B31.1 rules and had no existing fatigue analysis. Sixty-year transient cycle projections were necessary for several locations that were not included as limiting locations in the RCPB Fatigue Monitoring Program. Linear extrapolations of cycle occurrence data were used in the determination of the 60-year CUF values for these components, as shown in Table 4.3-1. For nickel-based alloys, F_{en} relationships were obtained from a paper, "Status of Fatigue Issues at Argonne National Laboratory," O. Chopra (presented at EPRI Conference on Operating Nuclear Power Plant Fatigue Issues & Resolutions, Snowbird, UT, August 22-23, 1996).

After the 60-year CUF values were multiplied by the appropriate F_{en} multipliers, each of the resulting environmentally-adjusted CUF values were shown to have a value less than 1.0, except for the Unit 1 feedwater nozzle. A refined fatigue analysis was required for the Unit 1 feedwater nozzle, which was prepared using finite element analysis techniques. Using the refined fatigue analysis, the 60-year environmentally adjusted CUF value for the Unit 1 feedwater nozzle was also shown to be less than 1.0.

Based on the above, each of the sample locations specified for an older vintage BWR in NUREG/CR-6260 have been shown to have 60-year environmentally-adjusted CUF values less than 1.0, and are acceptable for the period of extended operation.

**Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation; and
10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.**

4.3.4 REACTOR COOLANT PRESSURE BOUNDARY PIPING AND COMPONENT FATIGUE ANALYSES

4.3.4.1 Implicit Fatigue Analysis Design Basis and Methodology

Summary Description

Other than the RPV, the remaining reactor coolant pressure boundary (RCPB) components were originally designed in accordance with USAS B31.1-1967, Power Piping Code, which requires implicit fatigue analyses using stress range reduction factors instead of explicit CUF values. In addition, non-RCPB piping, valves, and components within the scope of License Renewal; e.g., main steam piping, pumps and valves, main steam safety/relief valves, and safety valves, were designed in accordance with either USAS B31.1 or ASME Section III, Class C codes which do not require an explicit fatigue analysis. Instead, these design codes account for cyclic loading by reducing the allowable stress for the component if the number of anticipated cycles exceeds certain limits. It requires the designer to determine the overall number of anticipated thermal cycles for the component and apply stress range reduction factors if this number exceeds 7,000. This implicit fatigue analysis method effectively reduces the allowable stress for the component, which keeps the applied loads below the endurance limit for the material.

Analysis

Since the affected components were designed considering the number of transient cycles postulated for 40 years, the License Renewal evaluation determines if the number of cycles for 60 years would require a reduction in stress beyond that originally applied during the original design process. These assessments can be made by comparing the design cycles projected to occur in 60 years against the 7,000 cycle criterion for a stress range reduction factor. If the total number of cycles projected for 60 years does not exceed 7,000, then the original design considerations remain valid.

Since the piping system components listed above are generally cycled in parallel with reactor operations, the 60-year projected cycles for the reactor vessel components in Table 4.3-1 can be used to estimate the cycles for the piping system components. Since the Unit 2 cycle totals are higher than the Unit 1 totals, they were conservatively applied in the evaluation.

The transient for daily reduction to 75% power results in a temperature change in the feedwater system, but this does not contribute to fatigue of components outside the feedwater system other than the RPV feedwater nozzles. Therefore, the 10,000 cycles associated with this event need not be considered for components outside the feedwater system. The total of all remaining transient cycles in the 60-year projections is 4,731. This is less than the 7,000 limit for a stress range reduction factor of 1.0 in USAS B31.1 and ASME Section III, Class C. This means no reduction in allowable stress is required, and the original design considerations for fatigue of the piping systems and components other than feedwater have been shown to remain valid for the period of extended operation.

For the feedwater system, the designer was required to consider the number of postulated cycles for 40 years and apply the appropriate stress range reduction factor from USAS B31.1.0. The applicable cycles would include the design cycles shown in Table 4.3-1 except for 123 boltup and 123 unbolt cycles, which do not affect the feedwater system. The total number of these cycles is approximately 13,000, which is in the range of 7,000 to 14,000, and required a stress range reduction factor of 0.9. For 60 years of operation, the total number of cycles other than boltup and unbolt would remain below 14,000 and would require the same stress range reduction factor of 0.9. Therefore, the original feedwater piping design considerations remain valid for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation.

4.3.4.2 Reactor Vessel Level Instrumentation Condensing Unit Fatigue Analyses

Summary Description

In 1994, the RPV Level Backfill system was installed to improve the reliability of the water level instrumentation. Since the thermal cycles contributing to fatigue of these components includes cycles associated with quarterly testing that do not correlate with reactor vessel transients, this analysis was evaluated separately. ASME Section III, Class 1 stress calculations and explicit fatigue analyses were performed during design of the system to document the effects of fatigue for temperature equalizing column instrument piping inside the Drywell, including the condensing chambers, steam leg, and reference leg piping. The effects of the 5% and 20% power uprates have been considered during the LR review, and it was concluded that the effects are insignificant relative to the original fatigue analyses. However, the effects from operating the system for the period of extended operation will result in an increased number of thermal cycles, which is evaluated below.

Analysis

The 40-year fatigue analyses included cycles for 120 plant startups and 160 stratification cycles (one per quarterly test), which equals 280, rounded up to 300. The maximum CUF values resulting from 300 cycles were much less than 1.0 for 40 years of service.

These analyses were projected for 60 years to bound operation for the period of extended operation. The bounding number of projected plant startups for 60 years from Table 4.3-1 is 244. The number of quarterly stratification cycles for 60 years is 240. The total number of cycles is 484, which will be rounded up to 500. Therefore, each of the CUF values from the present analyses was increased by a factor of 500/300 = 1.67 to account for 60 years of operation. The results were:

Condensing Chamber 60-year CUF = 0.05.
Condensing Chamber to Steam Leg Junction 60-year CUF = 0.03.
Remainder of the Steam Legs 60-year CUF = 0.15.

Since each of these values was less than 1.0, the components are considered qualified for 60 years of service.

The original analysis of the Unit 1 and 2 RPV Backfill System also considered high cycle fatigue that results from filling the hot instrument piping inside the Drywell with low temperature water. The resulting alternating stress intensities were determined to be less than the endurance limit for the material. This means the material may be subjected to an unlimited number of stress cycles of this magnitude without initiation of fatigue cracking. Therefore, there is no impact on this fatigue analysis from subjecting the component to an increased number of cycles associated with the period of extended operation. The existing fatigue analysis remains valid for 60 years.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation.

TABLE 4.3-1 REACTOR DESIGN TRANSIENTS AND 60-YEAR CYCLE PROJECTIONS

Reactor Pressure Vessel Design Cycle Description	40 Year Design Cycles	60-Year Projected Cycles	
		Unit 1	Unit 2
Bolt Up (70°F)	123	33	38
Design Hydro Test (1250 psig, 100°F)	130	33	38
Daily Reduction to 75% Power	10,000	10,000	10,000
Weekly Reduction to 50% Power	2,000	2,000	2,000
Control Rod Worth Test	400	400	400
<u>LOSS OF FEEDWATER HEATERS (310 total)</u>			
Turbine Trip with 105% Bypass	240	20	21
Loss of Heating to Feedwater Heater	70	10	10
<u>SCRAMS FROM 100% POWER (200 total)</u>			
Loss of Feedwater Pumps, Isolation Valves Close	10	2	2
Turbine Trip, Feedwater On, Isolation Valves Stay Open	40	120	127
Reactor Overpressure with Delayed Scram, Feedwater Stays On, Isolation Valves Stay Open	1	2	2
Single Relief Valve Blowdown	2	2	2
All Other Scrams	147	147	147
<u>NORMAL OPERATION</u>			
Improper Start of Cold Recirculation Loop	10	2	2
Sudden Start of Pump in Cold Recirculation Loop		2	2
Hydrostatic Test (1563 psig)	3	1	1
Unbolt	123	32	37
<u>START UPS</u>			
Start-up (100°F/hr up to 546°F)	120	173	244
<u>SHUT DOWNS</u>			
Cooldown (100°F/hr down to 100°F)	120	172	240

TABLE 4.3-2 REACTOR VESSEL 40-YEAR CUMULATIVE USAGE FACTORS

RPV Component (Material) LAS - Low Alloy Steel CS - Carbon Steel SS - Stainless Steel NBA - Nickel Based Alloy	**Original Stress Report** **40 Years**	**Plant Modifications Update** **40 Years**	**5% Power Uprate** **40 Years**
Main Closure Studs (LAS)	0.8000	0.757	0.81
Main Closure Flange (LAS)	Exempt		Exempt
RPV Skirt to Bottom Head (LAS)	0.0834		
Shroud Support (LAS portion)	0.0430		
Shroud Support (NBA portion)	0.1970		
Unit 1 FW Nozzle Forging (CS)	0.6170		
Unit 1 FW Nozzle Safe End (SS)	0.7584	0.3660	
Unit 1 FW Nozzle Thermal Sleeve (SS)		0.741	0.8560
Unit 1 FW Nozzle Spool Piece (CS)		0.0690	
Unit 2 FW Nozzle Forging (CS)	0.6170		
Unit 2 FW Nozzle Safe End (SS)	0.7584		0.9600
Control Rod Drive (CRD) Penetrations	Exempt		
CRD Hydraulic System Return Nozzle Forging (CS)	0.0070	Cut and Capped	
CRD Hydraulic System Return Nozzle Safe End (NBA)	0.7100	Cut and Capped	
Core Spray Nozzle Forging (LAS) and Transition Piece (CS)	0.5560	0.63	
Core Spray Nozzle Safe End (SS)	0.2700	0.98	0.96
Recirculation Inlet Nozzle (LAS)	0.2610	0.1100	
Recirculation Inlet Nozzle Safe End (NBA)	0.6340	0.8100	0.8600
Recirculation Outlet Nozzle (LAS)	Exempt	0.127	
Recirculation Outlet Nozzle Safe End(NBA)	0.0485	0.117	
Steam Outlet Nozzle (LAS)	Exempt		
Misc. Nozzles (LAS)	Exempt		
Refueling Bellows Support (CS)	0.7680		
Main Shell (including internal brackets)	0.1130		

TABLE 4.3-3 REACTOR VESSEL FATIGUE MONITORING PROGRAM RESULTS AND FATIGUE USAGE PROJECTIONS

RPV Component	1983 CUF Values to date UNIT 1 UNIT 2	1993 CUF Values to date UNIT1 UNIT 2	2002 CUF Values to date UNIT1 UNIT 2	40-Year CUF Projection UNIT 1 UNIT 2	60-Year CUF Projection UNIT 1 UNIT 2
Main Closure Studs	0.075 0.110	0.1688 0.1868	0.22675 0.24816	0.35 0.37	0.52 0.56
Feedwater Nozzle	0.040 (Note 1)	0.2228 0.06378 (Note 2)	0.33753 0.06407(Note 1,2)	0.52 0.10	0.79 (Note 3) 0.14 (Note 3)
Core Spray Nozzle Forging	0.086 0.129	0.01567 (Note 2) 0.04628 (Note 2)	0.02399 (Note 2) 0.05249 (Note 2)	0.037 0.08	0.055 0.12
Recirculation. Inlet Nozzle	0.025 0.035	0.00015 (Note 2) 0.00018 (Note 2)	0.00019 (Note 2) 0.00022 (Note 2)	0.0003 0.0003	0.0004 0.0005
Refueling Bellows Support	0.115 0.158	0.2325 0.2852	0.29533 0.35414	0.45 0.53	0.68 0.80

TABLE 4.3-2 NOTES:

1. The Unit 2 feedwater nozzle was not evaluated because the spargers and thermal sleeves were to be replaced. This plan later changed, and they were not replaced. However, the nozzle was subject to additional, refined fatigue analysis.
2. Refined fatigue analyses were performed for these components in addition to using actual number and severity of transients based upon monitoring data.
3. Adjusted to account for a 120% Extended Power Uprate.

TABLE 4.3-4 60-YEAR ENVIRONMENTALLY ADJUSTED CUF VALUE SUMMARY

Component	Material	60-Year CUF (4)	Overall Environmental Multiplier	60-Yr EAF-Adjusted CUF (4)	Notes
Reactor Vessel Shell and Lower Head	SA-533 Grade B, Cl. 1 (Low Alloy Steel)	0.1252	5.80	0.726	1, 2
Unit 1 Feedwater Nozzle Forging	SA-508, Class 2 (Low Alloy Steel)	0.3577	3.49	0.875	3, 7
Unit 1 Feedwater Nozzle Safe End	SB-564 (Inconel)	0.1526	1.49	0.227	3, 7
Unit 2 Feedwater Nozzle Forging	SA-508, Class 2 (Low Alloy Steel)	0.184	4.92	0.907	1, 3
Recirculation Outlet Nozzle	SA-508, Class 2 (Low Alloy Steel)	0.087	10.32	0.899	1,3
Recirculation Inlet Nozzle	SA-508, Class 2 (Low Alloy Steel)	0.0005	7.24	0.004	1, 8
Unit 1 Core Spray Nozzle	SA-508, Class 2 (Low Alloy Steel)	0.055	4.16	0.229	1, 8
Unit 2 Core Spray Nozzle	SA-508, Class 2 (Low Alloy Steel)	0.120	4.16	0.499	1, 8
Core Spray Nozzle Safe End	SA-182 F316L (Stainless Steel)	0.0007	8.36	0.006	1, 5
Recirculation and RHR Piping	SA-376 Grade TP316 (Stainless Steel)	0.0965	9.07 10.18	0.875 0.982	1, 6, 9
Feedwater Piping	SA-106 Grade B (Carbon Steel)	0.0831	1.79	0.149	5, 9

TABLE 4.3-3 NOTES:

1. The maximum F_{en} multiplier was used for this component assuming 50% HWC conditions and 50% NWC conditions.
2. Results using design cycles for 40 years, multiplied by 1.5 for 60 years.
3. Results using actual plant cycles projected to 60 years.
4. All results include the effects of Extended Power Uprate operation conservatively applied for 60 years of operation.
5. The environmental CUF results for this component are independent of HWC availability.
6. The 10.18 Fen multiplier is computed as follows based upon a 78% maximum HWC availability, a HWC multiplier of 11.51 and a NWC multiplier of 6.63: Overall Fen multiplier = (0.78 x 11.51) + (0.22 x 6.63) = 10.18. The 0.982 CUF value was determined using the 10.18 multiplier.
7. 60-year CUF value obtained from refined fatigue analysis based on finite element modeling.
8. Results using actual fatigue usage from RCPB Fatigue Monitoring Program projected for 60 years.
9. 60-year CUF value based on new ASME Section III, Class 1 fatigue analysis and projection of actual plant cycles for 60 years.

4.4 ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

Thermal, radiation, and cyclical aging analyses of plant electrical and I&C components required to meet 10 CFR 50.49 have been identified as time-limited aging analyses for BSEP.

The NRC has established nuclear station environmental qualification (EQ) requirements in 10 CFR 50, Appendix A, Criterion 4, and in 10 CFR 50.49. Section 50.49 specifically requires that an EQ program be established to demonstrate that certain electrical components located in harsh plant environments (that is, those areas of the plant that could be subject to the harsh environmental effects of a loss-of-coolant accident (LOCA), high energy line breaks (HELBs), or post-LOCA radiation) are qualified to perform their safety function in those harsh environments after the effects of in-service aging. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of environmental qualification.

4.4.1 ENVIRONMENTAL QUALIFICATION PROGRAM BACKGROUND

The BSEP Environmental Qualification Program meets the requirements of 10 CFR 50.49 for the applicable electrical components important to safety. 10 CFR 50.49 defines the scope of components to be included, requires the preparation and maintenance of a list of in-scope components, and requires the preparation and maintenance of a qualification file that includes component performance specifications, electrical characteristics and the environmental conditions to which the components could be subjected. Section 50.49(e)(5) contains provisions for aging that require, in part, consideration of all significant types of aging degradation that can affect component functional capability. Section 50.49(e) also requires replacement or refurbishment of components not qualified for the current license term prior to the end of designated life, unless additional life is established through ongoing qualification. Section 50.49(f) establishes four methods of demonstrating qualification for aging and accident conditions. Sections 50.49(k) and (l) permit different qualification criteria to apply based on plant and component vintage. Supplemental EQ regulatory guidance for compliance with these different qualification criteria is provided in the DOR Guidelines, Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors, November 1979; NUREG-0588, Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment, July 1981; and Regulatory Guide 1.89, Rev. 1, Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants, June 1984. Compliance with 10 CFR 50.49 provides reasonable assurance that the component can perform its intended functions during accident conditions after experiencing the effects of in-service aging.

The BSEP Environmental Qualification Program manages component thermal, radiation and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. Aging evaluations for electrical components in the BSEP Environmental Qualification Program that specify a qualification of at least 40 years are time-limited aging analyses (TLAAs) for license renewal because all of the criteria contained in 10 CFR 54.3 are met.

Under 10 CFR §54.21(c)(1)(iii), the BSEP Environmental Qualification Program, which implements the requirements of 10 CFR 50.49 (as further defined and clarified by the DOR Guidelines, NUREG-0588, and Regulatory Guide 1.89, Rev. 1), is viewed as an aging management program for license renewal. Reanalysis of an aging evaluation to extend the qualifications of components is performed on a routine basis as part of the BSEP Environmental Qualification 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 demonstration option (iii), which states that the effects of aging will be adequately managed for the period of extended operation, is chosen and the BSEP Environmental Qualification Program will manage the aging effects of the components associated with the environmental qualification TLAA. Section 4.4.2.1.3 of the "Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), April 2001, states that the staff evaluated the EQ program (10 CFR 50.49) and determined that it is an acceptable aging management program to address environmental qualification according to 10 CFR 54.21(c)(1)(iii). The evaluation referred to in the SRP-LR contains sections on *EQ Component Reanalysis Attributes* and *Evaluation and Technical Basis*, which is the basis of the description provided below.

4.4.2 EQ COMPONENT REANALYSIS ATTRIBUTES

The reanalysis of an aging evaluation is normally performed to extend the qualification by reducing excess conservatism incorporated in the prior evaluation. Reanalysis of an aging evaluation to extend the qualification of a component is performed on a routine basis pursuant to 10 CFR 50.49(e) as part of the BSEP Environmental Qualification Program. While a component life-limiting condition may be due to thermal, radiation or cyclical aging, the vast majority of component aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed ambient temperature of the component, an unrealistically low activation energy, or in the application of a component (de-energized versus energized). The reanalysis of an aging evaluation is documented according to BSEP quality assurance program requirements, which require the verification of assumptions and conclusions. As already noted, important attributes of a reanalysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). These attributes are discussed below.

Analytical Methods – The BSEP Environmental Qualification Program uses the same analytical models in the reanalysis of an aging evaluation 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 is, normal radiation dose for the projected installed life plus accident radiation dose). For license renewal, one acceptable method of establishing the 60-year normal radiation dose is to multiply the 40-year normal radiation dose by 1.5 (that is, 60 years/40 years). 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 & Reduction Methods – Reducing excess conservatism in the component service conditions (for example, temperature, radiation, cycles) used in the prior aging evaluation is the chief method used for a reanalysis per the BSEP Environmental Qualification Program. Temperature data used in an aging evaluation should be conservative and based on plant design temperatures or on actual plant temperature data. When used, plant temperature data can be obtained in several ways including monitors used for technical specification compliance, other installed monitors, measurements made by plant operators during rounds, and temperature sensors on large motors. A representative number of temperature measurements are conservatively evaluated to establish the temperatures used in an aging evaluation. Plant temperature data may be used in an aging evaluation in different ways, such as (a) directly applying the plant temperature data in the evaluation or (b) using the plant temperature data to demonstrate conservatism when using plant design temperatures for an evaluation. Any changes to material activation energy values as part of a reanalysis must be justified. Similar methods of reducing excess conservatism in the component service conditions used in prior aging evaluations can be used for radiation and cyclical aging.

Underlying Assumptions – BSEP Environmental Qualification Program EQ component aging evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected EQ component is evaluated and appropriate corrective actions are taken, which may include changes to the qualification bases and conclusions.

Acceptance Criteria and Corrective Action – Under the BSEP Environmental Qualification Program, the reanalysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by reanalysis, the component 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 (that is, sufficient time is available to refurbish, replace, or requalify the component if the reanalysis is unsuccessful).

4.4.3 CONCLUSION

The BSEP Environmental Qualification Program has been demonstrated to be capable of programmatically managing the qualified lives of the components falling within the scope of the program for license renewal. Based on the above review, the continued implementation of the BSEP Environmental Qualification Program provides reasonable assurance that the aging effects will be managed and that EQ components will continue to perform their intended functions for the period of extended operation. This result meets the requirements of 10 CFR 54.21(c)(iii). A comparison of the BSEP Environmental Qualification Program to the corresponding program in NUREG-1801 is provided in Appendix B, Subsection B.3.2.

4.5 <u>CONCRETE CONTAINMENT TENDON PRESTRESS</u>

NUREG-1800 assigns TLAA Section 4.5 to the issue of Concrete Containment Tendon Prestress. The containment structures for BSEP Units 1 and 2 have no prestressed tendons. Therefore, this section is not applicable.

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATIONS FATIGUE ANALYSIS

4.6.1 TORUS DOWNCOMER/VENT HEADER FATIGUE ANALYSIS

Summary Description

In 1975, subsequent to the establishment of the original design criteria for the boiling water reactor Mark I containment system design, additional load conditions were identified which relate to the pressure suppression concept. These additional loads result from the dynamic effects of Drywell air and steam being rapidly forced into the suppression pool during a postulated loss of coolant accident (LOCA) and from suppression pool response to safety/relief valve (SRV) operation generally associated with plant transient operating conditions. The industry initiated short- and long-term programs to quantify the hydrodynamic loads and restore the originally intended design safety margins. The Plant Unique Analysis Report - Mark I Containment Program for Brunswick Units 1 and 2 provides the results of the long-term program for BSEP 1 and 2. The vent system structures were evaluated for hydrodynamic loads resulting from postulated LOCA conditions and SRV discharge loads together with dead loads and seismic loads, including fatigue analysis of the limiting locations.

Analysis

The downcomer/vent header intersection was selected as the critical location in the vent system for fatigue damage because it is the area where maximum stresses occur due to condensation oscillation loads, chugging loads, and SRV air bubble drag loads. A finite element model was used to represent the limiting configurations of the vent header/downcomer assemblies. Fatigue analyses were prepared for two limiting downcomer/vent header locations (designated QUAD 2503 and QUAD 36 in the model) to determine the maximum fatigue contributions from each of these loading conditions. The results from the individual analyses were added to determine the total fatigue CUF for each location under design basis accident (DBA) and intermediate break accident (IBA) conditions.

For LR, to determine if these fatigue analyses remain valid for 60 years, the basis for 40-year projected occurrences must be reviewed, and 60-year projections for numbers of cycles and CUF values must be made.

Based upon the actual SRV actuations counted (through 1981), it was estimated that a total of 400 SRV actuations would occur over the 40-year plant life. Each SRV event produces cyclic response transients with amplitude (stress range) declining among successive cycles. Amplitude decays to zero after each event, but for the purpose of a conservative fatigue evaluation, 5 cycles were assumed for each SRV actuation event, and 2,000 equivalent maximum stress intensity cycles were used in the fatigue analysis.

For the 60-year projection of SRV actuations, a factor of 1.5 was applied to the 40-year cycles to account for the additional 20 years of service. Therefore, the number of SRV actuations for 60 years is projected as 600 with 5 equivalent maximum stress intensity cycles per actuation, and the 60-year CUF contribution for SRV actuations at the limiting location (QUAD 36) is 0.429.

The condensation oscillation (CO) loads are event-based, and the number of cycles will not increase as a result of operating the plant for 60 years. The number of cycles for the CO load harmonics was obtained by multiplying the duration of the event (DBA or IBA LOCA) by the frequency of the harmonics. The chugging loads are also event-based, accounting for the number of stress reversals due to chugging during the LOCA. Therefore, the number of cycles associated with chugging will not increase as a result of operating the plant for 60 years. Therefore, no increase in CUF value is expected for these event-based loads.

The results of the projection for both 40 and 60 years are shown on Table 4.6-1.

The limiting location QUAD 36 has been projected to have a 60-year CUF value of 0.579 which is less than 1.0 and is acceptable. Therefore, the fatigue analysis of the Torus downcomer/vent header intersection has been projected to remain valid for 60 years.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation.

4.6.2 TORUS-ATTACHED AND SRV PIPING SYSTEM FATIGUE ANALYSES

In August, 1981, the NRC raised a concern regarding the cyclic stress due to the Mark I (containment design) cyclic mechanical loads. The Mark I Owners' Group and GE proposed that a method be developed for piping fatigue evaluation and that the method be applied to piping systems representative of the most limiting in Mark I plants. It was agreed that the fatigue approach should be developed along the lines of the ASME Section III, Class 2/3 piping design methods. The loading cycles and loading cycle combinations applicable to the Mark I Containment Program load definitions were determined, and an "augmented" Class 2/3 fatigue methodology to account for cyclic mechanical loads was developed. This was used in evaluating representative limiting piping systems for BSEP.

The number of cycles used for the BSEP analyses was 2,000 cycles for 40 years. Since these results are representative of the most limiting locations for fatigue usage, the remainder of the Torus piping systems would have even lower fatigue usage.

For License Renewal, it is necessary to project the increased fatigue usage associated with normal operating cycles, but the fatigue usage associated with accident conditions need not be increased. However, the analysis does not separate the fatigue usage associated with normal operating cycles from the usage associated with accident conditions. Therefore, the entire fatigue usage will be conservatively factored to account for 60-year operation. Rather than increase the values by a factor of 1.5 to account for 60 years compared to 40 years originally analyzed, the values will be increased by a factor of 2.0, to provide additional allowance for future SRV actuations. The results of the projection for both 40 and 60 years are shown on Table 4.6-2.

The results are acceptable because the CUF is less than 1.0. Therefore, the fatigue analysis of the Torus attached and SRV discharge piping has been projected to remain valid for 60 years.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation.

TABLE 4.6-1 TORUS DOWNCOMER/VENT HEADER CUF SUMMARY

Event	Element No.	TERM	SRV	CO	Chugging	Total
IBA	QUAD 2503	40 YEARS	0.0286	0.0	0.09	0.12
		60 YEARS	0.0429	0.0	0.09	0.133
	QUAD 36	40 YEARS	0.286	0.0	0.15	0.44
		60 YEARS	0.429	0.0	0.15	0.579
DBA	QUAD 2503	40 YEARS	0.0286	0.108	0.0	0.14
		60 YEARS	0.0429	0.108	0.0	0.151
	QUAD 36	40 YEARS	0.286	0.004	0.0	0.29
		60 YEARS	0.429	0.004	0.0	0.433

TABLE 4.6-2 TORUS ATTACHED AND SRV PIPING CUF SUMMARY

Piping System & Size	Term	Fatigue Usage (Note 3)	
		NOC + DBA (Notes 1)	NOC + IBA/SBA (Note 2)
RCIC Turbine Exhaust (8-inch)	40 YEARS	0.086	0.340
	60 YEARS	0.172	0.680
RCIC Barometric Condenser (2-inch)	40 YEARS	0.001	0.003
	60 YEARS	0.002	0.006
SRV Discharge (12-inch)	40 YEARS	0.486	0.475
	60 YEARS	0.972	0.950

TABLE 4.6-2 NOTES:

1.	NOC = Normal Operating Cycles; DBA = Design Basis Accident
2.	IBA = Intermediate Break Accident; SBA = Small Break Accident
3.	Sixty-year values were computed by increasing the 40-year values by a factor of 2.0, increasing the number of qualified SRV actuations to 800 (5 cycles each).

4.7 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

4.7.1 SERVICE LEVEL I COATINGS QUALIFICATION

Summary Description

Service Level 1 coatings are the coatings used inside the primary containments of BSEP Units 1 and 2 that are considered safety-related because they could potentially detach during a design basis accident (DBA), and the coating debris could contribute to flow blockage of Emergency Core Cooling System (ECCS) suction strainers.

In a design basis accident, Emergency Core Cooling Systems (ECCS) at BSEP pump water from inside the suppression pool (Torus) to the reactor vessel to keep the core covered with water and make up losses from the pipe break location. These systems have suction piping located below the waterline inside the Torus. The suction piping is fitted with strainers to keep any debris that might become entrained in the Torus water from entering the systems. The concern with Service Level 1 coatings is that, if they were to detach from their substrates in large quantities, the potential would exist for the coating debris to accumulate on the surface of the strainers and reduce flow, eventually reducing the suction head of the pump below an acceptable level. The qualification of the coatings to withstand the effects of radiation and the DBA conditions assures these coatings will remain in place and not contribute to clogging of ECCS strainers beyond analyzed limits.

The original BSEP qualification tests were performed for the coatings prior to original plant startup using radiation values necessary to bound 40 years of service and using DBA parameters based upon original licensed thermal power levels. Additional qualifications were performed later to support the use of different brands of coating used for coating repairs and refurbishments from 1994 to the present.

The coatings used for Service Level 1 applications at BSEP were qualified and applied in accordance with the requirements of the following documents:

- USNRC Regulatory Guide 1.54, Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants, June, 1973
- ANSI N101.4-1972, Quality Assurance for Protective Coatings Applied to Nuclear Facilities
- ANSI N101.2 – 1972, Protective Coatings (Paints) for Light Water Nuclear Containment Facilities
- ANSI N512-1974, Protective Coatings (Paints) for the Nuclear Industry

Analyses

The DBA conditions during the period of extended operation will remain the same as those in the current license period which have been adjusted to account for a 20% extended power uprate. Therefore, the DBA testing parameters, including the temperature, pressure and time profiles, do not require further evaluation as TLAAs for license renewal, since they are not based upon 40-year assumptions. Since it is assumed that the degree of radiation exposure used in the qualification testing was intended to bound 40 years of operation, this evaluation will determine whether or not the radiation exposure used in the qualification tests bounds the projected exposure for 60 years of operation.

An analysis has been prepared that provides the design basis radiation projections for Environmental Qualification (EQ) of electrical components. The current revision of this document has been adjusted to account for previously approved power uprate conditions and the 60-year period of extended operation. The analysis defines the normal operational exposure as the sum of the gamma exposure and the neutron exposure, each projected for 60 years. The accident exposure is the sum of the beta exposure and peak accident exposure. The total integrated exposure is the sum of gamma, neutron, peak accident, and beta exposure. The bounding value is for the Torus, which has higher accident exposure than the Drywell (based upon conservative assumptions), and the same normal operation exposure. The 60-year bounding exposure projections for these individual radiation types in the Torus are as follows:

Gamma (normal operation)	0.8330×10^8 Rads
Neutron (normal operation	0.1220×10^8 Rads
Gamma (accident exposure)	0.5120×10^8 Rads
Beta (accident exposure)	2.0000×10^8 Rads
Total Integrated Exposure(60 Years plus accident)	3.4670×10^8 Rads

This is the worst-case bounding value for primary containment, using the value projected for the Torus. If a test coupon has been exposed to this level of radiation or greater, followed by acceptable DBA testing, it will be considered qualified for the 60-year period of extended operation.

The test reports used to qualify the specific coating types used inside primary containment were reviewed to determine the total radiation exposure applied during qualification testing. The qualified dose values were compared to the worst-case bounding 60-year plus accident radiation exposure calculated above. The coating types and combinations used inside containment have been qualified to at least 1.0×10^9 Rads. Based on this comparison, each of the qualification test reports currently used to support the use of Service Level 1 coating types used at BSEP have been evaluated with respect to radiation exposure levels for 60 years of service and have been determined to remain valid for the period of extended operation. Therefore, the qualification of Service Level I coatings has been projected to the end of the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses of qualification for Service Level 1 coatings have been projected to the end of the period of extended operation.

4.7.2 FUEL POOL GIRDER TENDON LOSS OF PRESTRESS

Summary Description

Two post-tensioned, concrete girders are used to support the Spent Fuel Pool of each Reactor Building. The concrete girders span the exterior walls of the Reactor Buildings. Tendons provide the post-tension force for the two concrete girders. The girders support the structure for the Fuel Pool, Steam Separator, and Dryer Pool, and Reactor Well. The tendons are not the pressure boundary retaining type supporting a conventional containment post-tensioning system. However, the structures supported are safety related.

The Fuel Pool Girders are approximately 5 feet wide, 41 feet deep and 150 feet in length. Each is post-tensioned with 12 pairs of parabolically draped Tendons. Each Tendon is anchored on the outside (north and south side) of the Reactor Buildings. The Tendons are unbonded and made up of 90 stress-relieved wires contained in a grease-filled conduit. The wires are ¼" in diameter and meet the ASTM A-421 specification with an Ultimate Tensile Strength (UTS) of 240 KSI. Grease was used for corrosion protection.

Prestressing force is not constant; it decreases over time due to a variety of design conditions. Some of the prestressing loss design conditions are for a one-time consideration. Others are time dependent and will continue to some degree for the life of the plant. However, it is noted that the majority of time dependent losses will occur during the earlier years of plant operation. The following design conditions were considered in the original evaluation of the Fuel Pool Tendons.

- Friction Losses (Initial Loss)
- Slip at Anchorage (Initial Loss)
- Elastic Shortening of Concrete (Initial Loss)
- Creep of Concrete (Time Dependent Loss)
- Shrinkage of Concrete (Time Dependent Loss)
- Relaxation of Steel Stress (Time Dependent Loss)

Analyses

Elastic shortening of concrete is considered only as an initial loss and will not be increased for the period of extended operation, this position is consistent with Regulatory Guide 1.35.1. Losses due to concrete shrinkage and creep are time dependent and decline over time; as such, the 40-year losses have been increased 25% to account for the 20-year period of extended operation. Relaxation of steel stress was considered to continue at the same rate as for the first 40 years and was therefore increased 50% to account for the 20-year period of extended operation. Based on the increased losses during the period of extended operation, the 60-year prestress value was projected to fall below the minimum required prestress; as such, the TLAA cannot be projected to the end of period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii). Therefore, the TLAA will require the alternative method of 10 CFR 54.21(c)(1)(iii) which permits adequately managing the loss of prestress for the period of extended operation. The applicable aging management program for managing loss of prestress is the Fuel Pool Girder Tendon Inspection Program, which is based on the current periodic testing/inspection program for the girders that was implemented in 1994. The current program includes, among other inspection activities, a load monitoring (lift-off test) of a sample of tendons from each girder. The program uses the guidelines of NRC Regulatory Guide 1.35 and ASME Section XI, Subsection IWL for ISI of containment post-tensioning systems. A frequency of once per five years has been established with the initial inspection having been completed in 1994.

Disposition	**10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.**

4.7.3 CRANE, REFUELING PLATFORM, AND MONORAIL HOIST CYCLIC LOAD LIMITS

Summary Description

The load cycle limits for cranes was identified as a potential TLAA. The following BSEP cranes are in the scope of License Renewal and have been identified as having a TLAA, which requires evaluation for 60 years:

- Reactor Building Cranes
- Refueling Platforms
- Intake Structure Crane
- Diesel Generator Bridge Crane
- Miscellaneous Monorails/Hoists

The method of review applicable to the crane cyclic load limit TLAA involves (1) reviewing the existing 40-year design basis to determine the number of load cycles considered in the design of each of the cranes in the scope of License Renewal, and

(2) developing 60-year projections for load cycles for each of the cranes in the scope of License Renewal and compare with the number of design cycles for 40 years.

Analyses

4.7.3.1 Reactor Building Cranes

The crane bay of each Reactor Building supports a 125-ton traveling bridge crane above the refueling floor.

The BSEP Reactor Building Crane purchasing specification required that the crane conform to the latest edition of CMAA, Specification 70 for Electric Overhead Traveling Cranes, Service Class A-1. The crane was therefore designed for 20,000 to 100,000 load cycles for a 40-year life.

The number of lifts originally projected for 40 years was 2,500. This can be multiplied by a factor of 1.5 to determine the number of cycles for 60-year life. Therefore, the number of load cycles projected for 60-year life is 3,750. This is less than the 20,000 to 100,000 permissible cycles and is therefore acceptable. Therefore, the Reactor Building Crane fatigue analysis has been successfully projected for 60 years of plant operation.

4.7.3.2 Refueling Platforms

The Refueling Platforms run on rails over the fuel pool and the reactor well on the 117 foot elevation of the Unit 1 and Unit 2 Reactor Buildings.

The BSEP Refueling Platform purchasing specification required that the lifting structure be manufactured in accordance with the Manual of Steel Construction, AISC code. The original cycle requirement for the Refueling Platform was based on an estimated number of cycles to support periodic refueling cycles for the 40-year lifetime. The number of lifts for 40 years was estimated to be 117,334 cycles.

Based on refueling operations history, the current estimate of number of movements required per refueling outage is 1,640 cycles per refueling cycle. The total number of refueling outages estimated for the 60-year life has been established as 35. Therefore, the total number of lifts in 35 outages is estimated to be 57,400 cycles. This is less than the 117,334 permissible cycles and is therefore acceptable. Therefore, the Refueling Platform fatigue analysis has been successfully projected for 60 years of plant operation.

4.7.3.3 Intake Structure Crane

The Intake Structure Crane is a four-wheel outdoor, double leg, cantilever gantry crane with single top running trolley and single hoist.

The BSEP Intake Structure Crane purchasing specification required that the crane conform to the latest edition of CMAA, Specification 70 for Electric Overhead Traveling Cranes, Service Class A-1. The crane was therefore designed for 20,000 to 100,000 load cycles for a 40 year life.

BSEP Intake Structure Gantry Crane is a relatively low-cycle lifting device used to support maintenance activities associated with the Intake Structure. Based on operating maintenance history, the maximum estimate of the number of major lifts / movements to support the Intake Structure area per year is 48. Therefore, the number of load cycles projected for 60 years is 2,880. This is less than the 20,000 to 100,000 permissible cycles and is therefore acceptable. Therefore, the Intake Structure Crane fatigue analysis has been successfully projected for 60 years of plant operation.

4.7.3.4 Diesel Generator Cranes

Each Diesel Generator located in the Diesel Generator Building has a hoist that is a single bridge, hand-operated crane with 5-ton chain hoist and plain trolley.

The BSEP Diesel Generator Bridge Crane purchasing specification required that the lifting structure be manufactured in accordance with the Manual of Steel Construction, AISC code. The AISC code permits up to 10,000 complete stress cycles at maximum stress to occur for the 40-year lifetime.

The BSEP Diesel Generator Bridge Crane is a relatively low-cycle lifting device used to support maintenance activities associated with the Diesel Generator Building. Based on operating maintenance history, the maximum estimate of the number of major lifts/ movements to support the Diesel Generator area per year is 10. Therefore, the number of load cycles projected for 60 years is 600. This less than the 10,000 permissible cycles and is therefore acceptable. Therefore, the Diesel Generator Bridge Crane fatigue analysis has been successfully projected for 60 years of plant operation.

4.7.3.5 Miscellaneous Monorails/Hoists

BSEP Miscellaneous Monorails/Hoists are structural/mechanical systems used during plant maintenance to move or remove equipment. Monorails/Hoists are not shared between units and are not required for abnormal or accident plant operating modes. The Miscellaneous Monorails/Hoists are specifically located / dedicated to major plant components that require periodic maintenance.

The BSEP Miscellaneous Monorails/Hoist purchasing specification required that the lifting structures to be manufactured in accordance with AISC Code 6th Edition. The AISC code permits up to 10,000 complete stress cycles at maximum stress to occur for the 40-year lifetime.

The BSEP Miscellaneous Monorails/Hoists are load rated appropriately for the removal and installation of sub-components for the plant system. The current estimate of maximum number of movements required per operating cycle for any miscellaneous monorail is no more than 60. The total number of operating cycles estimated for the 60 year life has been established as 35. Therefore the total number of lifts in 35 outages is estimated to be 2,100. This is less than the 10,000 permissible cycles and is therefore acceptable. Therefore, the Miscellaneous Monorail / Hoist fatigue analysis has been successfully projected for 60 years of plant operation.

Disposition: 10 CFR 54.21(c)(1)(ii) – Based on the above information, the analyses associated with the Reactor Building Cranes, Refueling Platforms, Intake Structure Crane, Diesel Generator Bridge Crane, and Miscellaneous Monorails/Hoists have been projected to the end of the period of extended operation.

4.7.4 TORUS COMPONENT CORROSION ALLOWANCE

Summary Description

The Primary Containment Torus has two environments – the immersed zone and the vapor zone. Components located in the immersed zone are located under water in the Torus Suppression Pool and are continuously wetted. Components located in the Torus vapor zone are located in the non-immersed areas of the Torus (dry areas). A lower corrosion rate exists in the vapor zone, because the vapor zone is blanketed with nitrogen during power operation.

The scope of this corrosion TLAA calculation only addresses selected uncoated carbon steel components associated with the Torus that were determined by analysis to have adequate corrosion margin for the remaining life of the plant. The entire torus liner has been coated, but there are localized areas that remain uncoated in the vapor zone where coatings were removed to permit welding of attachments. All structural components in the immersed zone are coated except for inaccessible areas, such as, the interior of pipe columns. The uncoated surfaces were evaluated for material loss over time based upon conservative corrosion rates. These corrosion evaluations were determined to be TLAAs.

The following Unit 1 and Unit 2 Torus components have been identified as having a corrosion allowance TLAA, requiring evaluation for 60 years.

- Torus Liner
- Torus ASME, Section XI, ISI Components Supports
- Torus Non-ASME, Section XI, ISI Component Supports
- Torus Miscellaneous Supports

The method of analysis involves (1) reviewing the existing 40-year design basis to determine the basis used to evaluate the material loss due to corrosion, (2) developing 60-year projections for Torus components subject to corrosion and comparing with minimum requirements established for the 40-year service period, and (3) draw conclusions.

Analyses

Torus Liner

The Unit 1 and Unit 2 coated liners in the immersed zone of the Torus have been fully coated and, therefore, are not part of this analysis.

The Unit 1 and Unit 2 uncoated areas of the Torus liners in the vapor zone have been evaluated. The method of evaluation involved determining a corrosion allowance and applying a corrosion rate. The nominal thickness of the liner is 0.375 inches, and the minimum required thickness is 0.25 inches. Allowing for a mill tolerance of 0.01 inch, the corrosion allowance available is 0.115 inch. The corrosion rate in the immersion zone was determined to be 0.00116 inch/year based on the results of plant calculations and measurements. The general corrosion rate for the vapor zone is conservatively assumed to be the same as the immersion zone. Applying the corrosion rate, the Unit 1 and Unit 2 uncoated areas of the Torus liners in the vapor zone have been evaluated to be acceptable for 60-year service period.

Torus ASME, Section XI, ISI Component Supports

The Unit 1 and Unit 2 Torus ASME, Section XI, ISI component supports are located in immersed as well as the vapor zones of the Torus. These supports, with the exception of their inaccessible areas, have been coated and therefore not considered in this analysis. The inaccessible areas associated with these supports are unable to be coated and were evaluated. Consideration was given to the corrosion allowance, the number of sides of the component exposed to the Torus environment, and the time at which the component had been installed. The immersed corrosion rate (0.00116 inch/year) was applied regardless of location of the support. Based on the evaluation, it was concluded that the uncoated, inaccessible areas of the Torus ASME, Section XI, ISI Component Supports located in immersed and vapor zones are acceptable for the 60-year service period.

Torus Non-ASME, Section XI, ISI Component Supports and Miscellaneous Supports

There are inaccessible areas associated with non-ASME, Section XI, ISI component supports in the Torus (immersed and in vapor environment) that were unable to be coated and are addressed in this analysis. The inaccessible areas of the Lower Column support for the Vent Header, located in immersed and vapor zones were not coated and did not meet the minimum thickness requirement for the 60-year service period. These supports require aging management activities for the 60-year service period. An inspection of the pipe wall thickness of the 6-inch diameter Lower Column support is required prior to the period of extended operation. The planned inspection method will be a representative volumetric (Ultrasonic) examination of the wall, with a comparison to the design basis minimum thickness requirement. Based on results, follow-up actions will be taken, as necessary, including further examinations or replacement of components. Also components associated with the platform steel (grating bearing bars, tubular and pipe support members) and miscellaneous supports with inaccessible areas located in the vapor zone did not meet the minimum thickness requirement for the 60-year service period. In addition, supports for the following piping runs were reviewed:

- RHR Test Line Pipe Supports
- RCIC Turbine Exhaust Line Pipe Supports
- RCIC Barometric Condenser Line Pipe Supports
- RCIC Turbine Drain Pot Line Pipe Supports
- HPCI Turbine Exhaust Line Pipe Supports
- Core Spray Test Line Pipe Supports
- RHR Cont. Cooling Line (Torus Spray Header) Supports
- Small Bore Pipe Supports & Conduit Supports

The corrosion rate used for these components and supports is based on the corrosion rate of 0.00116 inch/year, which was the value determined for components in the immersed zone. It is therefore proposed that the corrosion rate to be used for these components and supports be revised via a one-time inspection of actual component conditions in the vapor zone. The inspection method would rely on a representative volumetric (Ultrasonic) examination of uncoated components and supports above the Torus water line. The rate of corrosion would be established based on service to date and is expected to be considerably less than that for the immersion zone. The lower corrosion rate would then be applied to evaluate a 60-year service period.

Based on the above, the corrosion allowance analyses for certain non-ASME, Section XI, ISI Component Supports and miscellaneous supports in the Torus cannot be projected to the end of period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii). Therefore, an alternative method will be applied in accordance with 10 CFR 54.21(c)(1)(iii) which permits adequately managing degradation for the period of extended operation. The aging management activities will be predicated on the results of volumetric measurements performed on the components. Therefore, prior to the period of extended operation, the One-Time Inspection Program will be used to perform volumetric measurements to determine the actual rate of corrosion of the Vent Header Lower Column support in the immersed and vapor space of the Torus, and platform steel and miscellaneous supports in the vapor space of the Torus. Based on the results of the measurements, follow-up actions will be taken, as necessary, to project the corrosion allowance analyses to the end of the period of extended operation, or to establish aging management activities, including further examinations or replacement of components, to assure the components supports continue to perform their intended functions throughout the period of extended operation.

Disposition: **10 CFR 54.21(c)(1)(ii) – Based on the above information, the analyses associated with the Torus Liner and Torus ASME, Section XI, ISI component supports have been projected to the end of the period of extended operation.**

10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) of the Torus Non-ASME, Section XI, ISI and Torus Miscellaneous Piping component supports will be adequately managed for the period of extended operation.

APPENDIX A

UPDATED FINAL SAFETY ANALYSIS REPORT SUPPLEMENT

TABLE OF CONTENTS

A.0 UPDATED FINAL SAFETY ANALYSIS REPORT SUPPLEMENT

This appendix provides the information to be submitted in a Final Safety Analysis Report Supplement as required by 10 CFR 54.21(d) for the BSEP License Renewal Application. The License Renewal Application contains the technical information required by 10 CFR 54.21(a) and (c). Chapter 3 of the BSEP License Renewal Application identifies the programs and activities that manage the effects of aging for the proposed period of extended operation, and Appendix B describes the programs and activities. Chapter 4 contains the evaluations of time-limited aging analyses for the period of extended operation. License Renewal Application Chapters 3 and 4 and Appendix B have been used to prepare the program and activity descriptions that are contained in this Appendix. The information presented here will be incorporated into the BSEP UFSAR following issuance of the renewed operating license.

A.1 NEW UFSAR SECTION

The following information will be integrated into the UFSAR to document aging management programs and activities credited in the BSEP license renewal review and time-limited aging analyses evaluated to demonstrate acceptability during the period of extended operation.

A.1.1 AGING MANAGEMENT PROGRAMS AND ACTIVITIES

The integrated plant assessment and evaluation of time-limited aging analyses (TLAA) identified existing and new aging management programs necessary to provide reasonable assurance that components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis (CLB) for the period of extended operation. This section describes the programs and their implementation activities and identifies those programs that have been determined to be consistent with NUREG-1801, "Generic Aging Lessons Learned (GALL)."

Three elements common to all aging management programs are corrective actions, confirmation process, and administrative controls. These elements are included in the BSEP Quality Assurance (QA) Program, which implements the requirements of 10 CFR 50, Appendix B.

Prior to the period of extended operation, the elements of corrective action, confirmation process, and administrative controls in the BSEP QA Program will be applied to required aging management activities for both safety related and non-safety related structures and components subject to aging management review.

Upon issuance of a renewed license, guidance will be incorporated into administrative control procedures to identify existing SSCs not within the scope of license renewal that, because of plant modifications or analysis revisions, are consequently determined to meet the scoping criteria of 10 CFR 54.4. These plant modifications or analysis revisions will also be reviewed to determine if any existing analysis would have been a TLAA. The information required by 10 CFR 54.37(b) for these newly identified SSCs will be incorporated into the UFSAR.

A.1.1.1 ASME Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD Program

The ASME Section XI, Inservice Inspection, Subsection IWB, IWC, and IWD Program consists of periodic volumetric, surface, and/or visual examination of components for assessment, signs of degradation, and corrective actions. The Program is implemented in accordance with Section XI of the ASME B&PV Code, 1989 Edition (no addenda). The Program includes NRC-approved risk-informed provisions in accordance with the BSEP Risk-Informed (RI) ISI Program and is consistent with the corresponding program described in NUREG-1801.

A.1.1.2 Water Chemistry Program

To mitigate aging effects on component surfaces that are exposed to water as a process fluid, chemistry programs are used to control water chemistry for impurities (e.g., dissolved oxygen, chloride, and sulfate) that accelerate corrosion and cracking. The Program relies on monitoring and control of water chemistry to keep peak levels of various contaminants below the system-specific limits. Alternatively, chemical agents, such as corrosion inhibitors, oxygen scavengers, and biocides, may be introduced to prevent certain aging mechanisms. The BSEP Water Chemistry Program is currently based on the latest version of the EPRI guidelines in EPRI Report TR-103515-R2, February 2000, BWRVIP-79 for water chemistry in BWRs. The BSEP Water Chemistry Program will be updated as revisions to the guidelines are released.

A.1.1.3 Reactor Head Closure Studs Program

The Reactor Head Closure Studs Program is credited for aging management of the reactor head closure studs and stud components by means of inservice inspection. The closure studs, nuts, bushings, and washers are included within the scope of the ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD Program. The Reactor Head Closure Studs Program is consistent with the corresponding program described in NUREG-1801.

A.1.1.4 BWR Stress Corrosion Cracking Program

The BWR Stress Corrosion Cracking Program manages stress corrosion cracking (SCC) including intergranular SCC (IGSCC). The BWR Stress Corrosion Cracking Program is consistent with NUREG-0313, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping;" BWRVIP-75, “Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules;” and Nuclear Regulatory Commission Generic Letter 88-01, “NRC Position on Intergranular Stress Corrosion Cracking in BWR Austenitic Stainless Steel Piping," and its Supplement 1. The Program includes: (1) component replacement and preventive measures to mitigate SCC, and (2) inspections to monitor SCC and its effects. Replacement methodologies include piping replacement with SCC-resistant stainless steel. Preventive measures include heat sink welding, induction heating, mechanical stress improvement, and water chemistry control in accordance with industry recognized guidelines. Category A IGSCC-susceptible welds are subsumed into the Risk Informed ISI Program. The BWR Stress Corrosion Cracking Program is consistent with the corresponding program described in NUREG-1801.

A.1.1.5 Flow-Accelerated Corrosion Program

The Flow-Accelerated Corrosion (FAC) Program provides for prediction, inspection, and monitoring of piping, valves, and fittings for a loss of material aging effect due to FAC so that timely and appropriate action may be taken to minimize the probability of experiencing a FAC-induced consequential leak or rupture. The FAC Program elements are based on the recommendations identified in NSAC-202L-R2, “Recommendations for an Effective Flow-Accelerated Corrosion Program,” which requires controls to assure the structural integrity of carbon steel lines containing high-energy fluids (two-phase as well as single-phase). The BSEP FAC Program manages loss of material in carbon steel piping and fittings.

Prior to the period of extended operation, the BSEP FAC susceptibility analyses will be updated to include additional components potentially susceptible to FAC.

A.1.1.6 Bolting Integrity Program

The Bolting Integrity Program addresses aging management requirements for bolting on mechanical components within the scope of License Renewal. The BSEP Bolting Integrity Program utilizes industry recommendations and EPRI guidance which considers material properties, joint/gasket design, chemical control, service requirements and industry/site operating experience in specifying torque and closure requirements. The program relies on recommendations for a Bolting Integrity Program, as delineated in NUREG-1339, “Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants,” and industry recommendations, as delineated in the Electric Power Research Institute (EPRI) NP-5769, “Degradation and Failure of Bolting in Nuclear Power Plants,” and TR-104213, “Bolted Joint Maintenance & Application Guide,” for pressure retaining bolting within the scope of License Renewal. This Program does not prescribe aging management activities for structural bolting.

Prior to the period of extended operation, a precautionary note will be added to plant bolting guidelines to limit the sulfur content of compounds used on bolted connections.

A.1.1.7 Open-Cycle Cooling Water System Program

The Open-Cycle Cooling Water System Program addresses the aging effects of material loss and fouling due to micro- or macro-organisms and various corrosion mechanisms in the plant open-cycle cooling water systems. The Program includes monitoring, inspecting, and testing to verify heat transfer and provides assurance that aging effects for the open-cycle cooling water systems can be managed for an extended period of operation. This Program was originally developed in response to NRC Generic Letter 89-13, “Service Water System Problems Affecting Safety-Related Equipment.”

Prior to the period of extended operation, the Program will be enhanced to require that: (1) Program scope include portions of the SW System credited in the Aging Management Review, including non-safety related piping, (2) the RHR Heat Exchangers will be subject to eddy current testing with results compared to previous testing to evaluate degradation and aging, (3) A representative sampling of SW Pump casings be inspected, (4) Program procedures be enhanced to include verification of cooling flow and heat transfer effectiveness of SW Pump Oil Cooling Coils, inspections associated with SW flow to the DGs (including inspection of expansion joints), and inspection and replacement criteria for RHR Seal Coolers, and (5) Piping inspections will include locations where throttling or changes in flow direction might result in erosion of copper-nickel piping. Following enhancement, the Open-Cycle Cooling Water System Program will be consistent with the corresponding program described in NUREG-1801.

A.1.1.8 Closed-Cycle Cooling Water System Program

The Closed-cycle Cooling Water System Program addresses aging management of components in the Reactor Building Closed Cooling Water (RBCCW) and Diesel Generator (DG) Jacket Water Cooling Systems. These systems are closed cooling loops with controlled chemistry, consistent with the NUREG-1801 description of a closed-cycle cooling water system. Both the Reactor Building Closed Cooling Water and Diesel Generator Jacket Water Cooling Water Systems employ an effective chemistry program augmented by component testing and inspection based on Electric Power Research Institute (EPRI) TR-107396, “Closed Cooling Water Chemistry Guideline,” to assure the license renewal intended function(s) are maintained.

Prior to the period of extended operation, Program activities will be enhanced to assure that Preventive Maintenance activities include inspections of DG combustion air intercoolers and heat exchangers. Following enhancement, the Closed-Cycle Cooling Water System Program will be consistent with the corresponding program described in NUREG-1801.

A.1.1.9 Inspection of Overhead Heavy Load and Light Load Handling Systems Program

The Overhead Heavy Load and Light Load Handling Systems Program manages the aging effects of corrosion of structural components and wear of crane rails for the Reactor Building Bridge Cranes, the Refueling Platforms, and the Intake Structure Gantry Crane. The Program provides for periodic inspection of rails and structural members for degradation.

Administrative controls for the Program will be enhanced, prior to the period of extended operation to: (1) include in the Program all cranes/platforms within the scope of License Renewal, (2) specify an annual inspection frequency for the Reactor Building Bridge Cranes and the Intake Structure Gantry Crane, and every fuel cycle for the Refuel Platforms, (3) allow use of maintenance crane inspections as input for the condition monitoring of License Renewal cranes, (4) require maintenance inspection reports to be forwarded to the responsible engineer, and (5) include inspection of structural component corrosion and monitoring crane rails for abnormal wear. The enhanced Program will be consistent with the corresponding program described in NUREG-1801.

A.1.1.10 Fire Protection Program

The Fire Protection Program includes fire barrier inspections and a diesel-driven fire pump inspection. The fire barrier inspections require periodic visual inspection of fire barrier penetration seals; fire barrier walls, ceilings, and floors; and periodic visual inspection and functional tests of fire rated doors to ensure that their operability is maintained. The diesel driven fire pump inspection requires that the pump be periodically tested to ensure that the fuel supply line can perform its intended function. The Program also includes periodic inspection and testing of halon and carbon dioxide fire suppression systems.

A.1.1.11 Fire Water System Program

The Fire Water System Program includes system pressure monitoring, inspections, and periodic testing in accordance with applicable NFPA commitments. Periodic visual inspection of overall system condition and inspections of the internal surfaces of system piping, upon each entry to the system for routine or corrective maintenance, provide an effective means to determine whether corrosion and biofouling are occurring. These inspections include the sprinkler heads and assure that corrosion products that could block flow of the sprinkler heads are not accumulating These measures will allow timely corrective action in the event of system degradation to ensure the capability of the water-based Fire Suppression System to perform its intended function.

Prior to the period of extended operation, Program administrative controls will be enhanced to require assessing results from the initial 40-year service life tests and inspections to determine whether a representative sample of such results has been collected and whether expansion of scope and use of alternate test/inspection methods are warranted. Following enhancement, the Fire Water System Program will be consistent with the corresponding program described in NUREG-1801 and subsequent NRC interim staff guidance.

A.1.1.12 Aboveground Carbon Steel Tanks Program

The purpose of the Aboveground Carbon Steel Tanks Program is to manage aging effects of loss of material by performing inspections of carbon steel Fuel Oil, Condensate, and Fire Protection System tanks. The Program includes measures to monitor corrosion or degradation by: (1) inspection of the external surface of tanks that have protective paint or coating and sealant or caulking at the foundation interface, (2) performing one-time volumetric examinations of tank bottoms, and (3) performing one time inspections of all interior surfaces of the Condensate Storage Tanks and Fire Protection Water Storage Tank. When implemented, the Aboveground Carbon Steel Tanks Program will be consistent with the corresponding program described in NUREG-1801.

A.1.1.13 Fuel Oil Chemistry Program

Fuel oil quality is maintained by monitoring and controlling fuel oil contamination in accordance with the guidelines of the American Society for Testing Materials (ASTM) Standards specified in the BSEP Technical Specification Bases applicable to the Surveillance Requirements for fuel oil testing. Exposure to fuel oil contaminants, such as water and microbiological organisms is minimized by verifying the quality of new oil before its introduction into the storage tanks and by periodic sampling to assure that the tanks are free of water and particulates. Effectiveness of the Program is verified using thickness measurement of tank bottom surfaces to ensure that significant degradation is not occurring.

Prior to the period of extended operation: (1) Program administrative controls will be enhanced to add a requirement to trend data for water and particulates, (2) the condition of the in-scope fuel oil tanks will be verified by means of thickness measurements under the One-Time Inspection Program, and (3) an internal inspection of the Main Fuel Oil Storage Tank will be performed under the One-Time Inspection Program.

A.1.1.14 Reactor Vessel Surveillance Program

The Reactor Vessel Surveillance Program is mandated by 10 CFR 50, Appendix H. The Program is an Integrated Surveillance Program, in accordance with 10 CFR Part 50, Appendix H, Paragraph III.C, that is based on requirements established by the BWR Vessel and Internals Project reports.

This Program will be enhanced to ensure that any additional requirements that result from the NRC review of BWRVIP-116 are addressed prior to the period of extended operation. The enhanced Program will be consistent with the corresponding program described in NUREG-1801.

A.1.1.15 One-Time Inspection Program

The One-Time Inspection Program uses one-time inspections to verify the effectiveness of an aging management program and confirm the absence of an aging effect. The Program scope includes Water Chemistry and Fuel Oil Chemistry verifications specified by NUREG-1801, as well as plant specific inspections.

Prior to the period of extended operation, the One-Time Inspection Program will be enhanced by the addition of procedural controls for implementation and tracking of activities associated with the Program.

A.1.1.16 Selective Leaching of Materials Program

The Selective Leaching of Materials Program includes one-time inspections and qualitative determinations of selected components that may be susceptible to selective leaching. A sample population of susceptible components will be selected for the inspections prior to commencing the period of extended operation. The inspections will determine whether loss of material due to selective leaching is occurring, and whether the process will affect the ability of the components to perform their intended function(s) for the period of extended operation.

Following selection of a population of components for inspection, the Program will be consistent with the corresponding program described in NUREG-1801 with one exception involving the use of qualitative determinations, instead of Brinell material hardness testing, to identify the presence of selective leaching of material.

A.1.1.17 Buried Piping and Tanks Inspection Program

The Buried Piping and Tanks Inspection Program manages the aging effect of loss of material for the external surfaces of buried piping components in BSEP systems in scope for License Renewal. There are no buried tanks in this Program. The Program includes preventive measures to mitigate corrosion by protecting the external surface of buried piping components through use of coating or wrapping. The Program includes visual examinations of buried piping components when they are made accessible by excavation for maintenance or for some other reason.

The Program will be implemented prior to the period of extended operation and will include procedural requirements to (1) ensure an appropriate as-found pipe coating and material condition inspection is performed whenever buried piping within the scope of this Program is exposed, (2) add precautions concerning excavation and use of backfill to the excavation procedure to include precautions for License Renewal piping, (3) add a requirement that coating inspection shall be performed by qualified personnel to assess its condition, and (4) add a requirement that a coating engineer or other qualified individual should assist in evaluation of any coating degradation noted during the inspection.

A.1.1.18 ASME Section XI, Subsection IWE Program

The ASME Section XI, Subsection IWE Program consists of periodic inspection of steel containment components for signs of degradation, assessment of damage, and corrective actions. This Program is in accordance with ASME Section XI, Subsection IWE, 1992 Edition, including 1992 Addenda, and in accordance with 10 CFR 50.55a. The ASME Section XI, Subsection IWE Program is consistent with the corresponding program described in NUREG-1801.

A.1.1.19 ASME Section XI, Subsection IWL Program

The ASME Section XI, Subsection IWL Program is credited for the aging management of accessible and inaccessible pressure retaining Primary Containment concrete for both BSEP Units. The BSEP containment structures do not use prestressing tendons.

Therefore, ASME Section XI, Subsection IWL rules regarding post-tensioning systems are not applicable. This Program is in accordance with ASME Section XI, Subsection IWL, 1992 Edition, including 1992 Addenda, and in accordance with 10 CFR 50.55a. The ASME Section XI, Subsection IWL Program is consistent with the corresponding program described in NUREG-1801 with the exception of requirements associated with a post-tensioning system are not applicable.

A.1.1.20 ASME Section XI, Subsection IWF Program

The ASME Section XI, Subsection IWF Program consists of periodic visual examination of component supports for loss of material and loss of mechanical function. This Program is in accordance with ASME Section XI, Subsection IWF, 1989 Edition, and in accordance with ASME Code Case N-491.

Prior to the period of extended operation, the Program will be enhanced to include the torus vent system supports within the scope of the Program. Following enhancement, the ASME Section XI, Subsection IWF Program will be consistent with the corresponding program described in NUREG-1801.

A.1.1.21 10 CFR 50, Appendix J Program

The 10 CFR Part 50, Appendix J Program consists of monitoring of leakage rates through containment liner/welds, penetrations, fittings, and access openings to detect degradation of the pressure boundary. Corrective actions are taken if leakage rates exceed acceptance criteria. This Program is implemented in accordance with Option B (performance based leak testing) of 10 CFR Part 50, Appendix J; Regulatory Guide 1.163; and NEI 94-01, “Industry Guideline for Implementing Performance Based Option of 10 CFR Part 50, Appendix J.” The Program is consistent with the corresponding program described in NUREG-1801.

A.1.1.22 Masonry Wall Program

The Masonry Wall Program consists of inspections, based on NRC IE Bulletin 80-11, “Masonry Wall Design,” for managing cracking of masonry walls. The Program manages the aging effect of cracking for masonry walls within the Service Water Building, Reactor Building, Augmented Off-Gas Building, Diesel Generator Building, Control Building, and Turbine Building. The Program is a condition monitoring program with the inspection frequencies established such that no loss of intended function would occur between inspections.

Prior to the period of extended operation, the administrative controls for the Program will be enhanced to require inspecting all accessible surfaces of the walls for evidence of cracking. Following enhancement, the Masonry Wall Program will be consistent with the corresponding program described in NUREG-1801.

A.1.1.23 Structures Monitoring Program

The Structures Monitoring Program consists of periodic inspection and monitoring of the condition of structures and structure component supports to ensure that aging degradation leading to loss of intended functions will be detected and that the extent of degradation can be determined. This Program is implemented in accordance with Maintenance Rule, 10 CFR50.65; NEI (NUMARC) 93-01, “Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” Rev. 2, and Regulatory Guide 1.160, “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” Rev. 2. The inspection criteria are based on ACI 349.3R-96, “Evaluation of Existing Nuclear Safety-Related Concrete Structures;” and ASCE 11-90, “Guideline for Structural Condition Assessment of Existing Buildings;” as well as, INPO Good Practice document 85-033, “Use of System Engineers;” and NEI 96-03, “Guidelines for Monitoring the Condition of Structures at Nuclear Plants.”

Prior to the period of extended operation, the Structures Monitoring Program will be enhanced to: (1) identify License Renewal systems managed by the Program and inspection boundaries between structures and systems, (2) require notification of the responsible engineer regarding availability of exposed below-grade concrete for inspection and require that an inspection be performed, (3) identify specific license renewal commodities and inspection attributes, (4) require responsible engineer review of groundwater monitoring results, (5) specify that an increase in sample size for component supports shall be implemented (rather than should be) commensurate with the degradation mechanisms found, and (6) improve training of system engineers in condition monitoring of structures. Following enhancement, the Structures Monitoring Program will be consistent with the corresponding program described in NUREG-1801.

A.1.1.24 Protective Coating Monitoring and Maintenance Program

The Protective Coating Monitoring and Maintenance Program prevents clogging of ECCS suction strainers and containment spray nozzles by monitoring the condition of coatings and assuring that the quantity of damaged, degraded, or unqualified coatings inside the Primary Containment of each Unit which could detach during a loss-of-coolant accident (LOCA) remains below established design limits.

Prior to the period of extended operation, the Program administrative controls will be enhanced to: (1) add a requirement for a walk-through, general inspection of containment areas during each refueling outage, including all accessible pressure-boundary coatings not inspected under the ASME Section XI, Subsection IWE Program, (2) add a requirement for a detailed, focused inspection of areas noted as deficient during the general inspection, (3) assure that the qualification requirements for persons evaluating coatings are consistent among the Service Level I coating specifications, inspection procedures, and application procedures, and meet the requirements of ANSI N 101.4, “Quality Assurance for Protective Coatings Applied to Nuclear Facilities,” and (4) document the results of inspections and compare the results to previous inspection results and to acceptance criteria. Following enhancement, the Program will be consistent with the corresponding program described in NUREG-1801 with the exception that the Program is not credited in the License Renewal review for preventing corrosion of primary containment components.

A.1.1.25 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is credited for aging management of cables and connections not included in the BSEP Environmental Qualification (EQ) Program. Under this Program, accessible electrical cables and connections installed in adverse localized environments are visually inspected at least once every 10 years for cable and connection jacket surface anomalies, such as embrittlement, discoloration, cracking, swelling, or surface contamination, which are precursor indications of conductor insulation aging degradation from heat, radiation, or moisture. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service condition for the electrical cable or connection. This Program is consistent with the corresponding program described in NUREG-1801.

A.1.1.26 Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program

The Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is credited for the aging management of radiation monitoring and neutron flux monitoring instrumentation cables not included in the BSEP EQ Program. Exposure of electrical cables to adverse localized environments caused by heat or radiation can result in reduced insulation resistance (IR). A reduction in IR is a concern for circuits with sensitive, low-level signals such as radiation monitoring and nuclear instrumentation circuits, since it may contribute to signal inaccuracies. For radiation monitoring instrumentation circuits, the results of routine calibration tests will be used to identify the potential existence of cable aging degradation. For neutron flux instrumentation circuits, field cables will be tested at least once every 10 years. Testing may include IR tests, time domain reflectometry (TDR) tests, current versus voltage (I/V) testing, or other testing judged to be effective in determining cable insulation condition. This Program is consistent with the corresponding program described in NUREG-1801, with the exception that it allows direct cable testing for neutron flux monitoring circuits.

A.1.1.27 Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is credited for aging management of cables not included in the BSEP EQ Program. In-scope, medium-voltage cables exposed to significant moisture and significant voltage are tested at least once every 10 years to provide an indication of the condition of the conductor insulation. The specific type of test performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, polarization index, or other testing that is state-of-the-art at the time the test is performed. Significant moisture is defined as periodic exposures that last more than a few days (e.g., cable in standing water). Periodic exposures that last less than a few days (e.g., normal rain and drain) are not significant. Significant voltage exposure is defined as being subjected to system voltage for more than 25% of the time. The moisture and voltage exposures described as significant in these definitions are not significant for medium-voltage cables that are designed for these conditions (e.g., continuous wetting and continuous energization are not significant for submarine cables). This Program is consistent with the corresponding program described in NUREG-1801.

A.1.1.28 Reactor Coolant Pressure Boundary Fatigue Monitoring Program

The Reactor Coolant Pressure Boundary (RCPB) Fatigue Monitoring Program includes preventive measures to mitigate fatigue cracking caused by anticipated cyclic strains in metal components of the reactor coolant pressure boundary. This is accomplished by monitoring and tracking the significant thermal and pressure transients for limiting reactor coolant pressure boundary components in order to prevent the fatigue design limit from being exceeded. The Program addresses the effects of the reactor coolant environment on component fatigue life by including, within the Program scope, environmental fatigue evaluations of the sample locations specified in NUREG/CR-6260, “Application of NUREG/CR-5999, Interim Fatigue Curves to Selected Nuclear Power Plant Components,” for older-vintage BWRs. This Program is consistent with the corresponding Program described in NUREG-1801, with the exception that the limiting locations selected for monitoring will be those with a 60-year Cumulative Usage Factor (CUF) value (including environmental effects, where applicable) of 0.5 or greater.

Prior to the period of extended operation, the Program will be enhanced to: (1) expand the Program scope to include an evaluation of each reactor coolant pressure boundary component beyond the Reactor Pressure Vessel, including each NUREG/CR-6260 location, (2) provide preventive action requirements including requirement for trending and consideration of operational changes to reduce the number or severity of transients affecting a component, (3) include a requirement to reassess the locations that are monitored considering the RCPB locations that were added to the Program scope, (4) specify the selection criterion to be locations with a 60-year CUF value (including environmental effects where applicable) of 0.5 or greater, (5) address corrective actions for components approaching limits, with options to include a revised fatigue analysis, repair or replacement of the component, or in-service inspection of the component (with prior NRC approval), and (6) address criteria for increasing sample size for monitoring if a limiting location is determined to be approaching the design limit.

A.1.1.29 Environmental Qualification (EQ) Program

The existing BSEP Environmental Qualification (EQ) Program is credited for aging management of electric equipment important to safety in accordance with the requirements of 10 CFR 50.49. 10 CFR 50.49 requires EQ components that are not qualified for the current license term to be refurbished, replaced, or have their qualifications extended prior to reaching the aging limits established in the aging evaluation. Reanalysis of aging evaluations to extend the qualifications of components is performed on a routine basis as part of the EQ Program. Important attributes for the reanalysis of aging evaluations include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria and corrective actions (if acceptance criteria are not met). TLAA demonstration option 10 CFR §54.21(c)(1)(iii), which states that the effects of aging will be adequately managed for the period of extended operation, has been chosen. The EQ Program will manage the aging effects of the components associated with the environmental qualification TLAA. This Program is consistent with the corresponding program described in NUREG-1801.

A.1.1.30 Reactor Vessel and Internals Structural Integrity Program

The Reactor Vessel and Internals Structural Integrity Program includes:

- Inspection in accordance with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program and inspection and flaw evaluation in conformance with the guidelines of the Boiling Water Reactor Vessel and Internals Project (BWRVIP) documents.
- Monitoring and control of reactor coolant water chemistry, through the use of the BSEP Water Chemistry Program, in accordance with the latest guidelines of the BWRVIP, helps ensure the long-term integrity and safe operation of the Reactor Vessel and Internals components.

Prior to the period of extended operation, the Program will be enhanced to:
(1) incorporate augmented inspections of the top guide using enhanced visual examination that will focus on the high fluence region and (2) establish inspection criteria for the VT-3 examination of the Core Shroud Repair Brackets.

A.1.1.31 Systems Monitoring Program

The Systems Monitoring Program will manage aging effects such as loss of material and cracking for external surfaces of piping, heat exchangers, ductwork, tanks, and other mechanical components within the scope of License Renewal. Specific guidelines for assessing the material condition of components during system walkdowns will be incorporated into administrative controls used to implement the Program. The aging effects will be managed through visual inspection and monitoring of external surfaces.

Prior to the period of extended operation, a procedure will be developed to implement: 1) inspection of in-scope License Renewal components for identified aging effects, 2) guidelines for establishing inspection frequency requirements, 3) listing of inspection criteria in checklist form, 4) recording of extent of condition during system walkdowns and 5) addressing of appropriate corrective action(s) for degradations discovered.

A.1.1.32 Preventive Maintenance Program

The Preventive Maintenance (PM) Program assures that various aging effects are managed for a wide range of components. PM activities, including periodic component replacement, inspections, and testing, may be used to manage aging effects and mechanisms. The PM Program uses scheduled inspections and predetermined criteria to ensure that aging effects are managed.

Prior to the period of extended operation, activities will be incorporated into the Program, as needed, to satisfy aging management reviews of components that rely on the PM Program for management of aging effects.

A.1.1.33 Phase Bus Aging Management Program

The Phase Bus Aging Management Program is credited for aging management of in-scope iso-phase and non-segregated phase bus. The Program involves several activities conducted at least once every 10 years to identify the potential existence of aging degradation. Activities include sampling accessible bolted connections for adequate torque and performing visual inspections for signs of cracks, corrosion, foreign debris, excessive dust buildup, evidence of water intrusion, or discoloration, which may indicate overheating. The Program applies to the iso-phase bus as well as all non-segregated 4.16KV and 480V phase bus within the scope of License Renewal. Industry operating experience has shown that phase bus exposed to appreciable ohmic or ambient heating during operation may experience loosening of bolted connections related to the repeated cycling of connected loads or of the ambient temperature environment.

A.1.1.34 Fuel Pool Girder Tendon Inspection Program

The Fuel Pool Girder Tendon Inspection Program manages loss of prestress in the fuel pool girder tendons of each Reactor Building. The fuel pool girder tendons are not associated with the containment pressure boundary and are not within the scope of the ASME Section XI, Subsection IWL Program. However, the Fuel Pool Girder Tendon Inspection Program is conservatively based on guidance from the ASME Section XI, Subsection IWL Program. The Program visually inspects and physically tests a representative sample of tendons. Inspection results are used to project an estimated loss of prestress through the next inspection period to ensure the tendon prestressing values do not fall below the minimum design requirements.

Prior to the period of extended operation, the Program will be enhanced to: (1) specify inspection frequencies, numbers of tendons to be inspected, and requirements for expansion of sample size, (2) identify test requirements and acceptance criteria for tendon lift-off forces, measurement of tendon elongation, and determination of ultimate strength, (3) specify inspections for tendons, tendon anchor assemblies, surrounding concrete, and grease, (4) require prestress values to be trended and compared to projected values, and (5) identify acceptable corrective actions for tendons that fail to meet testing criteria.

A.1.2 EVALUATION OF TIME LIMITED AGING ANALYSES

A.1.2.1 Reactor Vessel Neutron Embrittlement

Calculations have been performed to determine neutron fluence projections applicable to the reactor vessel and internals at 54 EFPY, which bounds 60 years of operation, using an NRC-approved methodology. The fluence projections have been used in the following analyses.

A.1.2.1.1 Upper Shelf Energy Evaluation

Upper-shelf energy (USE) is the standard industry parameter used to indicate the maximum toughness of a material at high temperature. However, the Charpy tests performed on BSEP reactor pressure vessel (RPV) materials under the code of record provided limited Charpy impact data. It was not possible to develop original Charpy impact test USE values using methods invoked by 10 CFR 50, Appendix G. Therefore, BSEP was required to demonstrate that lower values of USE will provide margins of safety against fracture equivalent to those required.

For plates and welds, end-of-life fracture energy was evaluated during the current license period by using the equivalent margin analysis (EMA) methodology described in NEDO-32205-A. This methodology was approved by the NRC as documented in a letter from the BWR Owners' Group (L. England) to the NRC (D. McDonald), dated March 24, 1994, "BWR Owners' Group Topical Report on Upper Shelf Energy Equivalent Margin Analysis – Approved Version", BWROG-94037, (Accession No 94038280161). This analysis confirmed that an adequate margin of safety against fracture, equivalent to 10 CFR 50, Appendix G requirements, does exist.

The USE values for BSEP materials were evaluated by an EMA using the 54 EFPY calculated fluence and BSEP surveillance capsule results. The results are also compared to the limits from BWRVIP-74-A, "BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal," June, 2003, which has been approved by the NRC for use in License Renewal reviews. The results show that the limiting Charpy USE EMA percent reduction is less than the BWRVIP-74-A acceptance criteria in all cases.

Therefore, a 60-year USE EMA for BSEP plates and welds has been prepared using a methodology previously reviewed and approved by the NRC, and the results meet the applicable acceptance criteria in all cases. Thus, the USE values for plates and welds have been satisfactorily projected through the end of the period of extended operation.

In its response to Generic Letter 92-01, Revision 1, Supplement 1, dated November 16, 1995, BSEP committed to provide a plant-specific USE EMA for reactor pressure vessel N16 forged nozzles. Each reactor vessel contains two, 2-inch nominal pipe size forged instrument nozzles, N16A and N16B, within the upper beltline region. BSEP performed a plant-specific EMA as required by 10 CFR 50, Appendix G. The analysis showed that the N16 nozzles for both reactor vessels should have had an initial, unirradiated USE (UUSE) of at least 70 ft-lbs. In addition, the USE was not anticipated to drop more than 18% for either reactor vessel, based upon a conservative projection of the end-of-life fluence. Therefore, the end-of-life USE of the nozzles for both vessels was anticipated to remain higher than the minimum screening criterion of 50 ft-lbs.

For added conservatism, an EMA was also performed per the guidelines provided in USNRC Regulatory Guide 1.161. This analysis demonstrated that the N16 nozzles would meet the ASME Code, Section XI, Appendix K, and Regulatory Guide 1.161 J-R fracture toughness requirements with an end-of-life USE as low as 29 ft-lbs. It was also shown that a 29 ft-lb end-of-life USE value would be equivalent to an initial USE of 35 ft-lbs, conservatively assuming the 18% drop in USE over the life of the vessels. As noted above, it has been shown that the subject nozzle material should have an initial USE of at least 70 ft-lbs. In a Safety Evaluation dated October 16, 1998, the NRC staff concluded that the BSEP EMA for the nozzle forgings is sufficiently conservative and, therefore, is acceptable.

For License Renewal, the EMA has been reviewed using the predicted neutron fluence for 60 years of operation. The predicted 60-year fluence for the N16 nozzles is below the value used in the EMA that has previously been reviewed and approved by the NRC. Therefore, the USE equivalent margins analysis for the N16 nozzle forgings has been demonstrated to remain valid for the period of extended operation.

A.1.2.1.2 Adjusted Reference Temperature Analysis

The BSEP reactor vessels were designed for a 40-year life with an assumed neutron exposure of less than 1.0E+19 n/cm^2 from energies exceeding 1.0 MeV. The CLB calculations use realistic calculated fluence values that are lower than this limiting value. The design basis value of 1.0E+19 n/cm^2 bounds calculated fluence values for the original 40-year term for both units.

For License Renewal, the 54 EFPY fluence values at the ¼T location have been used to determine the 60-year Adjusted Reference Temperature (ART) values for each beltline material for Unit 1 and Unit 2. The same initial nil-ductility transition temperatures submitted in the BSEP response to Generic Letter 92-05, Revision 1, Supplement 1, were used in the License Renewal ART calculations, except that a new value was estimated for Girth Weld FG using the General Electric estimation method. The 60-year ART value was computed by determining the initial $RT_{NDT(U)}$ for the unirradiated material and then determining the shift due to irradiation effects, ΔRT_{NDT}, which is added to the initial value. A margin term is added to account for uncertainties, resulting in the upper bound value for ART.

The ART analyses for BSEP Unit 1 and Unit 2 have been projected to the end of the period of extended operation. The values for BSEP Unit 1 and Unit 2 for the limiting component (highest ART value) in each unit are shown below, along with the corresponding inside surface fluence and ¼T fluence. The ART values were used to determine Operating Pressure-Temperature Limits for the RPV.

Parameter	Unit 1 Limiting Component	Unit 2 Limiting Component
	Plate B8496-1	N16 Nozzle forging heat Q2Q1VW
Inside surface fluence (n/cm^2) (E>1.0 MeV)	4.00E+18	1.38E+18
¼T Fluence (n/cm^2) (E>1.0 MeV)	2.86E+18	0.99E+18
¼T ART (°F)	136.1	125.1

A.1.2.1.3 RPV Operating Pressure-Temperature (P-T) Limits

The Adjusted Reference Temperature (ART) is the value of Initial RT_{NDT} + ΔRT_{NDT} + margins for uncertainties at a specific location. Neutron embrittlement increases the ART. Thus, the minimum temperature at which a reactor vessel is allowed to be pressurized increases over the licensed period. The ART of the limiting beltline material is used to correct the beltline operating P-T limits to account for irradiation effects. 10 CFR Part 50, Appendix G, requires reactor vessel thermal limit analyses to determine operating P-T limits for boltup, hydrotest, pressure tests, and normal operating and anticipated operational occurrences.

The BSEP Technical Specifications contain P-T limit curves for heatup, cooldown, and in-service leakage and hydrostatic testing and also limit the maximum rate of change of reactor coolant temperature. The normal operation core critical curves provide limits for both heat-up and criticality calculated for a 32 EFPY operating period. Because of the relationship between the P-T limits and the ART of the reactor vessel, BSEP requires new P-T limits for the period of extended operation.

P-T limit curves applicable for BSEP Units 1 and 2 for 60 years have been developed based upon 54 EFPY fluence projections. These curves were developed to account for the increased fluence associated with the period of extended operation, and show that adequate operating margins will exist when they are used.

A.1.2.1.4 RPV Circumferential Weld Examination Relief

The NRC staff issued a Safety Evaluation Report by NRC letter (G. Lainas) to the BWRVIP (C. Terry), dated July 28, 1998: “Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report (TAC No. M93925).” This evaluation concluded that the failure frequency of RPV circumferential welds in BWR reactors was sufficiently low to justify elimination of inservice inspection (ISI) of these welds. A supplemental Safety Evaluation Report (SER) was provided on March 7, 2000.

On November 10, 1998, the NRC issued Generic Letter (GL) 98-05, “Boiling Water Reactor Licensees Use of the BWRVIP-05 Report to Request Relief from Augmented Examination Requirements on RPV Shell Welds.” GL 98-05 stated that BWR licensees may request permanent relief (for the remaining term of operation under the existing license) from ISI requirements of 10 CFR 50.55a(g) for the volumetric examination of circumferential RPV welds (ASME Code Section XI, Table IWB-2500-l, Examination Category B-A, Item 1.11, “Circumferential Shell Welds”), upon demonstrating that:

1. the limiting conditional failure probability for circumferential welds satisfies the values specified in the NRC staff’s July 28, 1998, SER; and
2. licensees have implemented operator training and established procedures that limit the frequency of cold overpressure events to the amount specified in the NRC staff’s July 28, 1998, SER.

BSEP submitted a request for relief and has received this relief for the remaining 40-year licensed operating period.

For the period of extended operation, the 54 EFPY fluence values for BSEP are bounded by both the 32 EFPY and 64 EFPY fluence values in the NRC analysis. The BSEP Units 1 and 2 weld materials have lower copper and nickel values than those used in the NRC analysis. Hence, there is a smaller chemistry factor. As a result, the shifts in reference temperature for Units 1 and 2 are lower than both the 32 EFPY and 64 EFPY shift from the NRC SER analysis. The combination of unirradiated reference temperature ($RT_{NDT(U)}$) and shift (ΔRT_{NDT}) yields adjusted reference temperatures for Units 1 and 2 that are considerably lower than the NRC mean analysis values. Therefore, the RPV shell weld embrittlement due to the additional fluence associated with the period of extended operation has a negligible effect on the probabilities of RPV shell weld failure. The Mean RT_{NDT} values for Units 1 and 2 at 54 EFPY are bounded by the 32 EFPY and the 64 EFPY Mean RT_{NDT} provided by the NRC.

Although a conditional failure probability has not been calculated, the fact that the BSEP values for Mean RT_{NDT} at the end of the 60-year license are less than both the 32 EFPY and 64 EFPY values provided by the NRC leads to the conclusion that the BSEP RPV conditional failure probability is bounded by the NRC analysis. Therefore, the TLAA has been projected through the end of the period of extended operation.

A.1.2.1.5 RPV Axial Weld Failure Probability

In order to gain RPV circumferential weld examination relief, it was required to demonstrate that the axial weld failure rate is no more than 5×10^{-6} per reactor-year. The basis for this relief request was an analysis that satisfied the limiting conditional failure probability for the circumferential welds at the expiration of the current license based on BWRVIP-05 and the extent of neutron embrittlement. The NRC SER associated with BWRVIP-05 concluded that the reactor vessel failure frequency due to failure of the limiting axial welds in the BWR fleet at the end of 40 years of operation is less than 5 x 10^{-6} per reactor-year.

A comparison has been made between the limiting axial weld properties at 54 EFPY for BSEP Units 1 and 2 against the values taken from Table 3 found in the supplement to the NRC SER for BWRVIP-05. The limiting axial welds at BSEP Units 1 and 2 are all welds with similar chemistry. Based on the comparison, the limiting weld chemistry, chemistry factor, and 54 EFPY mean RT_{NDT} values are within the limits of the values assumed in the analysis performed by the NRC staff. Thus, the probability of failure for the axial welds is bounded by the NRC evaluation. Therefore, the axial weld failure analysis has been demonstrated to remain valid for the period of extended operation.

A.1.2.1.6 Core Shroud Reflood Thermal Shock Analysis

BSEP has been analyzed for an end-of-life (40-year) thermal shock analysis performed for the core shroud for a design basis loss-of-coolant accident (LOCA) followed by a low-pressure coolant injection. The reflood shock refers to the stress imposed upon the shroud due to contact between the hot shroud and the cold water injected to reflood the vessel. The ability of the shroud to withstand this shock was determined by comparing the amount of strain that would be imposed by the shock loading to the amount of strain the material could withstand, using material property values that would be expected after 40 years of radiation exposure. The original analysis compared the calculated thermal shock material strain (0.57%) to the strain required to fail the material (50%) and concluded that the peak strain resulting from thermal shock at the inside of the shroud represents no loss of integrity of the reactor vessel inner volume.

For License Renewal, the predicted neutron fluence exceeds the value assumed in the original analysis. The 54 EFPY fluence at the most irradiated point on the core shroud was calculated to be less than 8.0E+21 n/cm^2 (E >1.0 MeV). However, the measured value of percent elongation for stainless steel weld metal is 4% for a temperature of 297°C (567°F) with a neutron flux of 8.0E+21 n/cm^2 (E >1.0 MeV), while the average value for base metal at 290°C (554°F) is 20% based on values provided in BWRVIP-35. Thus, the thermal shock effects on the shroud at the point of highest irradiation level will not jeopardize the proper functioning of the shroud following the design basis accident during the period of extended operation. Therefore, the core shroud reflood thermal shock analysis has been demonstrated to remain valid for the period of extended operation.

A.1.2.1.7 Core Plate Plug Spring Stress Relaxation

BSEP Unit 2 has installed mechanical-type core plate plugs in the bypass flow holes of the core support plate. The spring-loaded plugs were designed to withstand typical and worst-case transient differential pressures. However, the spring that provides preload to the core plate plug is expected to relax as a function of thermal and neutron exposure. The loss of preload may cause the plug to leak at a higher rate than the designed. The projected relaxation is based upon 40-year fluence values. Since the spring relaxation would exceed acceptable limits if exposed to a 54 EFPY fluence value, projecting the analysis for 60 years is not feasible. Therefore, loss of pre-load due to stress relaxation of the core plate plug spring will be managed programmatically by means of the Reactor Vessel and Internals Structural Integrity Program.

A.1.2.1.8 Core Shroud Repair Hardware Analysis

In 1994, twelve bolted clamps were installed on the BSEP Unit 1 core shroud to structurally replace the H2 and H3 horizontal welds due to the cracking that had been discovered in these welds. Identical clamps were subsequently installed on the Unit 2 core shroud. The repair hardware is subject to loss of material properties due to neutron irradiation.

An analysis was performed to compare the design neutron fluence of the core shroud repair hardware to the calculated neutron fluence that the hardware would experience at 54 EFPY, which bounds 60 years of operation. Based on the analysis, it was concluded that the derived design end-of-life fluence value of 7.26E+21 n/cm^2 bounds both the peak fluence value of 4.16E+21 n/cm^2 for Unit 1 and the peak fluence value of 4.17E+21 n/cm^2 applicable to Unit 2, with considerable margin. Therefore, the core shroud repair hardware analysis remains valid since the hardware design accounted for material property loss resulting from neutron exposure that bounds the neutron exposure projected for the 60-year extended operating period.

A.1.2.2 Metal Fatigue

A.1.2.2.1 Reactor Vessel Fatigue Analyses

The original reactor pressure vessel (RPV) stress report included fatigue analyses for the reactor vessel components based on a set of design basis duty cycles. The list of transients used in these calculations was intended to envelope foreseeable thermal and pressure cycles which could be expected to occur within a nominal 40-year operating period for the plant. Fatigue analyses demonstrated that if components were exposed to a bounding set of postulated transient cycles, the Cumulative Usage Factor (CUF) for the components would remain below 1.0.

Since the original design, modifications have been made to replace a number of components, resulting in updated fatigue analyses. The safe ends and thermal sleeves for certain RPV nozzles were replaced, including those for the core spray nozzles, the recirculation inlet nozzles, and the feedwater nozzles (Unit 1 only). The RPV nozzle forgings were not replaced. A revised method of tensioning the reactor head closure bolts with fewer passes has also been developed, and a revised fatigue analysis was prepared. Also, a power uprate to 105% of original licensed thermal power (OLTP) was implemented for each BSEP Unit, which increased RPV temperature and pressure, resulting in increased fatigue usage. Revised fatigue analyses were performed on limiting components to account for these modifications and operational changes.

Sixty-year fatigue usage projections have been made for License Renewal based upon extrapolation of data obtained from the RCPB Fatigue Monitoring Program for limiting components. Originally, fatigue monitoring only tracked the number of occurrences of transients that occurred in the reactor coolant system of each Unit. However, improvements have been made to the RCPB Fatigue Monitoring Program that permit determination of the severity of the transients that actually occur. A log of operating parameters from cyclic operations is used to determine the range and rate of temperature and/or pressure change associated with each transient, which is then converted to cumulative fatigue usage. Plant cyclic data have been used to periodically compute the actual CUF to-date for limiting components. The RCPB Fatigue Monitoring Program licensing basis was revised from a method that compares transient cycles to the number originally used in the design fatigue analyses to a method that compares the actual CUF to date to the CUF design limit of 1.0. The list of design cycles used in the initial fatigue analyses is considered historical. For License Renewal, the results from the computer-based monitoring program were used to predict the fatigue usage expected for 40 years and 60 years of operation using linear extrapolation of the actual fatigue usage that occurred from initial plant startup through 2002.

An extended power uprate to 120% OLTP has been implemented for each Unit. However, unlike the 105% uprate, the 120% uprate had minimal impact upon fatigue of reactor vessel components since the reactor temperature and pressure were not significantly increased.

Based on the results of the 60-year fatigue usage projections summarized above, the fatigue usage factors for limiting components have been projected to remain below the ASME Code allowable of 1.0 for 60 years. The fatigue usage will continue to be monitored during the period of extended operation by the RCPB Fatigue Monitoring Program and the fatigue usage to-date will be periodically compared to the CUF limit of 1.0 to assure this limit is not exceeded.

A.1.2.2.2 Reactor Vessel Internals Fatigue Analyses

The design codes for the RPV did not require a fatigue analysis to be performed for non-pressure boundary RPV Internals components. However, the RPV shroud support and RPV internal brackets, which are attached to the pressure-boundary components, were included in the RPV fatigue analyses. The fatigue analyses for these components remain valid through the period of extended operation in accordance with the discussion above for the RPV. No other fatigue TLAAs were identified for RPV Internals components.

A.1.2.2.3 Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping (Generic safety Issue 190)

Plant-specific environmental fatigue calculations were performed for BSEP Units 1 and 2 for each of the locations provided in NUREG/CR-6260 for the older vintage GE plant, which represents the same vintage plant as BSEP. Environmental fatigue correction factors (F_{en}) were computed for each location to account for reactor water temperature, oxygen content, strain, and strain rates. Separate F_{en} multipliers were computed for Hydrogen Water Chemistry (HWC) conditions and for Normal Water Chemistry conditions to account for the effects of dissolved oxygen on F_{en}, and these values were combined based upon historical HWC operational data and conservative projections of future HWC system operation. Each of the fatigue analyses were adjusted to account for environmental effects by applying the F_{en} multiplier to 60-year CUF projections.

Class 1 RHR return line and feedwater line piping required new ASME Section III, Class 1 fatigue analyses, because they were designed in accordance with USAS B31.1 rules and had no existing fatigue analysis. Sixty-year transient cycle projections were necessary for several locations that were not included as limiting locations in the RCPB Fatigue Monitoring Program. Linear extrapolations of cycle occurrence data were used in the determination of the 60-year CUF values for these components.

After the 60-year CUF values were multiplied by the appropriate F_{en} multipliers, each of the resulting environmentally-adjusted CUF values were shown to have a value less than 1.0, except for the Unit 1 feedwater nozzle. A refined fatigue analysis was required for the Unit 1 feedwater nozzle, which was prepared using finite element analysis techniques. Using the refined fatigue analysis, the 60-year environmentally adjusted CUF value for the Unit 1 feedwater nozzle was also shown to be less than 1.0.

Based on the above, each of the sample locations specified for an older vintage BWR in NUREG/CR-6260 has been shown to have 60-year environmentally-adjusted CUF values less than 1.0 and is acceptable for the period of extended operation.

A.1.2.2.4 Reactor Coolant Pressure Boundary Piping and Component Fatigue Analyses

Other than the RPV, the remaining reactor coolant pressure boundary (RCPB) components were originally designed in accordance with USAS B31.1-1967, Power Piping Code, which requires implicit fatigue analyses using stress range reduction factors instead of explicit CUF values. In addition, non-RCPB piping, valves, and components were designed in accordance with either USAS B31.1 or ASME Section III, Class C, codes which do not require an explicit fatigue analysis. Instead, these design codes account for cyclic loading by reducing the allowable stress for the component if the number of anticipated cycles exceeds certain limits. This implicit fatigue analysis method effectively reduces the allowable stress for the component, which keeps the applied loads below the endurance limit for the material.

For those components designed with implicit fatigue limits, even though the resulting number of cycles projected for 60-years exceeds the original 40-year design cycles, the additional cycles would not require a change in the appropriate stress range reduction factor from USAS B31.1.0 used in the original analyses. Therefore, the original implicit fatigue analysis for RCPB piping and components remains valid for the period of extended operation.

A.1.2.2.5 Reactor Vessel Level Instrumentation Condensing Units

A RPV Level Backfill System was installed to improve the reliability of the level instrumentation. ASME Section III, Class 1 stress calculations and explicit fatigue analyses were performed to document the effects of fatigue for temperature equalizing column instrument piping inside the drywell, including the condensing chambers, steam leg, and reference leg piping.

The enveloping load set used in the fatigue analyses was assumed to include 300 cycles for a design life of 40 years. The maximum CUF values were much less than 1.0 for 40 years of service. These analyses were projected for 60 years to bound operation for the period of extended operation. The bounding number of projected plant startups for 60 years was determined to be 500, and the 60-year CUF values were calculated using a factor based on the ratio of 60-year to 40-year cycles. The CUF values for affected components remained less than 1.0. Therefore, the components are considered qualified for 60 years of service.

The original analysis of the Unit 1 and 2 RPV Backfill System considered high cycle fatigue from filling temperature equalizing column instrument piping inside the drywell. The resulting alternating stress intensities were determined to be less than the endurance limit for the material. This means the material may be subjected to an unlimited number of stress cycles of this magnitude without any fatigue concerns. Therefore, there is no impact on this fatigue analysis from subjecting the component to an increased number of cycles associated with the period of extended operation. Based on the above, the existing fatigue analysis has been determined to remain valid for the period of extended operation.

A.1.2.3 Environmental Qualification of Electric Equipment

Thermal, radiation, and cyclical aging analyses of plant electrical and I&C components required to meet 10 CFR 50.49 and evaluated to demonstrate qualification for the 40-year life of the plant have been identified as time-limited aging analyses. The existing BSEP Environmental Qualification (EQ) Program will adequately manage equipment aging for the period of extended operation, because equipment will be replaced prior to reaching the end of its qualified life. Reanalysis addresses attributes of analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, corrective actions if acceptance criteria are not met, and timeliness of reanalysis. Application of the EQ Program assures that qualification of electric equipment required to meet 10 CFR 50.49 will be maintained throughout the period of extended operation.

A.1.2.4 Torus Component Fatigue Analyses

A.1.2.4.1 Torus Downcomer/Vent Header Thermal Fatigue Analysis

The Plant Unique Analysis Report - Mark I Containment Program for Brunswick Units 1 and 2 provided the results of the long-term containment program for BSEP 1 and 2. The vent system structures were evaluated for hydrodynamic loads resulting from postulated LOCA conditions and SRV discharge loads together with dead loads and seismic loads, including fatigue analysis of the limiting locations.

The downcomer/vent header intersection was selected as the critical location in the vent system for fatigue damage, because it is the area where maximum stresses occur due to condensation oscillation loads, chugging loads, and SRV air bubble drag loads. A finite element model was used, and fatigue analyses were prepared for two limiting locations. Based upon the actual SRV actuations counted (through 1981), it was estimated that a total of 400 SRV actuations would occur over the 40-year plant life, and a conservative number of maximum stress intensity cycles were used in the fatigue analysis.

For the 60-year projection of SRV actuations, a factor of 1.5 was applied to the 40-year cycles to account for the additional 20 years of service. The condensation oscillation and chugging loads are event-based, and the number of cycles will not increase as a result of operating the plant for 60 years. Using these projections, the CUF for the limiting location has been projected to have a 60-year CUF value of 0.579 which is less than 1.0 and is acceptable. Therefore, the fatigue analysis of the torus downcomer/vent header intersection has been projected to remain valid for 60 years.

A.1.2.4.2 Torus-Attached and SRV Piping System Fatigue Analyses

In August, 1981, the NRC raised a concern regarding the cyclic stress due to the Mark I (containment design) cyclic mechanical loads. A method was developed for piping fatigue evaluation, and the method was applied to piping systems representative of the most limiting in Mark I plants. It was agreed that the fatigue approach should be developed along the lines of the ASME Section III, Class 2/3 piping design methods.

The number of cycles used for the BSEP analyses was 2,000, based upon a 40-year assumption of 400 SRV actuations, with 5 full severity cycles associated with each actuation, which is conservative. Since these results are representative of the most limiting locations for fatigue usage, the remainder of the torus piping systems would have even lower fatigue usage.

For License Renewal, it is necessary to project the increased fatigue usage associated with normal operating cycles, but the fatigue usage associated with accident conditions need not be increased. However, the analysis does not separate the fatigue usage associated with normal operating cycles from the usage associated with accident conditions. Therefore, the entire fatigue usage was conservatively factored to account for 60-year operation. Rather than increase the values by a factor of 1.5 to account for 60 years, the values were increased by a factor of 2.0. The results are acceptable because the CUF remains less than 1.0. Therefore, the fatigue analysis of the torus attached and SRV discharge piping has been projected to remain valid for 60 years.

A.1.2.5 Service Level I Coatings Evaluation

Service Level 1 coatings are the coatings used inside the Primary Containments of BSEP Units 1 and 2 that are considered safety related because they could potentially detach during a design basis accident (DBA), and the coating debris could contribute to flow blockage of Emergency Core Cooling System (ECCS) suction strainers. The original BSEP qualification tests were performed for the coatings prior to original plant startup using radiation values necessary to bound 40 years of service and using DBA parameters based upon original licensed thermal power levels. Additional qualifications were performed later to support the use of different brands of coating used for coating repairs and refurbishments from 1994 to the present.

The DBA conditions during the period of extended operation will remain the same as those in the current license period which have been adjusted to account for the extended power uprate. Therefore, with the exception of total integrated radiation dose, the DBA testing parameters do not require further evaluation. An analysis has been prepared that provides the design basis radiation projections for Environmental Qualification (EQ) of electrical components. The analysis defines the normal operational exposure as the sum of the gamma exposure and the neutron exposure, each projected for 60 years. The accident exposure is the sum of the beta exposure and peak accident exposure. The total integrated exposure is the sum of gamma, neutron, peak accident, and beta exposure. The bounding value is for the Torus, which has higher accident exposure than the drywell (based upon conservative assumptions), and the same normal operation exposure.

The test reports used to qualify the specific coating types used inside Primary Containment were reviewed to determine the total radiation exposure applied during qualification testing. The qualified dose values were compared to the worst-case bounding 60-year plus accident radiation exposure determined for the Torus. Based on this comparison, each of the qualification test reports currently used to support the use of Service Level 1 coating types used at BSEP has been determined to remain valid for the period of extended operation. Therefore, the qualification of Service Level I coatings has been projected to the end of the period of extended operation.

A.1.2.6 Fuel Pool Girder Tendon Loss of Prestress

Two post-tensioned, concrete girders are used to support the Spent Fuel Pool of each Reactor Building. The concrete girders span the exterior walls of the Reactor Buildings. Tendons provide post-tension for the two concrete girders. The post-tensioned girders support the structure for the Fuel Pool, Steam Separator and Dryer Pool, and Reactor Well. The tendons are not the pressure boundary retaining type supporting a conventional containment post-tensioning system. However, the structures supported are safety related. The prestressing forces generated by the tendons diminish over time due to losses in prestressing forces in the tendons and in the surrounding concrete. The design basis anchor forces for the tendons were originally based on losses projected for a 40-year period. Additional losses due to the 20-year period of extended operation will analytically reduce the design basis anchor forces below those required for the tendons to perform their intended function. Therefore, the TLAA cannot be projected to the end of the period of extended operation; and this analysis relies on an aging management program in accordance with 10 CFR 54.21 (c)(1)(iii) to adequately manage the tendons for the period of extended operation. Thus, the Fuel Pool Girder Tendon Inspection Program will be employed to manage the effects of loss of tendon prestress.

A.1.2.7 Crane, Refueling Platform, And Monorail Hoist Cyclic Load Limits

Load lifting cranes within the scope of License Renewal, have service limitations based upon the number of load cycles they can safely withstand.

The Reactor Building Cranes, Refueling Platform, Intake Structure Crane, Diesel Generator Bridge Cranes, and Miscellaneous Monorails/Hoists have been identified as having 40-year TLAAs for structural fatigue considerations. In support of License Renewal, the cranes have been evaluated for structural fatigue considerations for a 60-year service period. The evaluations are summarized in the following paragraphs.

A.1.2.7.1 Reactor Building Crane

The BSEP Reactor Building Crane is a low-cycle lifting device. The total number of load cycles projected for 60 years is 3,750. This is less than the 20,000 to 100,000 permissible cycles originally projected for 40 years and is therefore acceptable. Based on the foregoing, the BSEP Reactor Building Cranes have been evaluated, and the fatigue analysis has been successfully projected for 60 years.

A.1.2.7.2 Refueling Platform

The Refueling Platform is the most cycled of all the BSEP in-scope lifting devices. The total number of load cycles projected for 60 years is 57,400 cycles. This is less than the 117,334 permissible cycles originally projected for 40 years and is therefore acceptable. Based on the foregoing, the BSEP Refueling Platform has been evaluated, and the fatigue analysis has been successfully projected for 60 years.

A.1.2.7.3 Intake Structure Crane

The BSEP Intake Structure Crane is a relatively low-cycle lifting device. The total number of load cycles projected for 60 years is 2,880. This is less than the 20,000 to 100,000 permissible cycles and is therefore acceptable. Based on the foregoing, the BSEP Intake Structure Crane has been evaluated, and the fatigue analysis has been successfully projected for 60 years.

A.1.2.7.4 Diesel Generator Bridge Cranes

The Diesel Generator Bridge Cranes are relatively low-cycle lifting devices. The total number of load cycles projected for 60 years is 600. This is less than the 10,000 permissible cycles and is therefore acceptable. Based on the foregoing, the BSEP Diesel Generator Bridge Cranes have been evaluated, and the fatigue analysis has been successfully projected for 60 years.

A.1.2.7.5 Miscellaneous Monorails/Hoists

The BSEP Monorails/Hoists are specifically located/dedicated to major plant components that require periodic maintenance. The Monorails/Hoists are low-cycle lifting devices. The usage factor for the monorail used to support the HPCI Room has been determined to envelope other in-scope monorails. The total number of load cycles for this monorail, projected for 60 years, is 2,100. This is less than the 10,000 permissible cycles and is therefore acceptable. Based on the foregoing, the BSEP Monorails/Hoists have been evaluated, and the fatigue analysis has been successfully projected for 60 years.

A.1.2.8 Torus Component Corrosion Allowance

The scope of analysis includes uncoated components located in the Torus:

- Torus Liner
- Torus ASME, Section XI, ISI Supports
- Torus Non-ASME, Section XI, ISI Supports, and
- Torus Miscellaneous Supports

The method of analysis includes (1) reviewing the existing 40-year design basis to determine the basis used to evaluate the material loss due to corrosion, (2) developing 60-year projections for Torus components subject to corrosion and comparing with minimum requirements established for the 40-year service period.

The Unit 1 and Unit 2 Torus Liners in the immersed zone of the Torus have been fully coated and, therefore, are not included in this analysis. The uncoated areas of the Torus liners in the vapor zone have been evaluated to be acceptable for the 60-year service period.

ASME, Section XI, ISI component supports in the Torus (immersed and in vapor environment) have been coated and therefore not identified as a TLAA. However, there are inaccessible areas associated with these supports that were unable to be coated. The ASME, Section XI, ISI component supports with inaccessible areas that were unable to be coated have been evaluated to be acceptable for a 60-year service period.

Certain non-ASME, Section XI, ISI component supports and miscellaneous supports in the Torus environment have not been coated. There are inaccessible areas associated with the Vent Header supports that were unable to be coated. Also components associated with the platform steel (grating bearing bars, tubular and pipe support members) and miscellaneous supports with inaccessible areas located in the vapor zone have not been coated. These components have been determined to not meet the minimum thickness requirement for the 60-year service period. This evaluation was based on the corrosion rate that was determined for components in the immersed zone and is considered very conservative for components located in the vapor zone. Therefore, based on this determination, measurements are planned, using the One-Time Inspection Program, to verify actual component conditions in the Torus. The inspection would rely on volumetric measurements to determine the actual rate of corrosion of the Vent Header Lower Column support in the immersed and vapor space of the Torus, and platform steel and miscellaneous supports in the vapor space of the Torus. The measurements will be performed prior to the period of extended operation. Based on the results of the measurements, follow-up actions will be taken, as necessary, to project the corrosion allowance analyses to the end of the period of extended operation, or to establish aging management activities, including further examinations or replacement of components, to assure the components supports continue to perform their intended functions throughout the period of extended operation.

APPENDIX B

AGING MANAGEMENT PROGRAMS

TABLE OF CONTENTS

LIST OF TABLES

B.0 AGING MANAGEMENT PROGRAMS

B.1 INTRODUCTION

B.1.1 OVERVIEW

License Renewal aging management program (AMP) descriptions are provided in this appendix for each program credited for managing aging effects based upon the aging management review results provided in Sections 3.1 through 3.6 of this application.

Each AMP discussed in this Appendix has ten (10) program elements consistent with the definitions in Appendix A.1, Section A.1.2.3 of NUREG-1800, the Standard Review Plan for License Renewal (SRP-LR). These elements have been incorporated into the AMPs described in Sections X and XI of NUREG-1801, the “Generic Aging Lessons Learned” (GALL) report. In addition, program descriptions for plant-specific, non-NUREG-1801, AMPs provide detailed discussion of the 10 elements. Therefore, the AMP descriptions address these elements either implicitly, for NUREG-1801 AMPs, or explicitly, for plant-specific AMPs.

B.1.2 METHOD OF DISCUSSION

For those AMPs that are consistent with the assumptions made in Sections X and XI of NUREG-1801, or are consistent with exceptions, each program discussion is presented in the following format:

- A summary description of overall program form and function is provided.
- A statement is made regarding consistency of the program with NUREG-1801.
- Exceptions to the NUREG-1801 program are outlined, and justifications provided.
- Enhancements to ensure consistency with NUREG-1801, or additions to the NUREG-1801 program to manage aging for additional components with aging effects not assumed in the NUREG-1801 program, are proposed. A proposed schedule for completion is discussed.
- Operating Experience information specific to the program is provided.
- A conclusion section provides a statement of reasonable assurance that the program is effective, or will be effective, once enhanced.

For those programs that are plant-specific, the above form is generally followed with the additional discussion of each of the 10 elements in the program description.

B.1.3 QUALITY ASSURANCE PROGRAM AND ADMINISTRATIVE CONTROLS

Three elements common to all aging management programs are corrective actions, confirmation process, and administrative controls. These elements are included in the BSEP Quality Assurance (QA) Program, which implements the requirements of 10 CFR 50, Appendix B. A description of the QA Program is provided in UFSAR, Section 17.3.

The elements of corrective action, confirmation process, and administrative controls in the BSEP QA Program will be applied to required aging management activities for both safety related and non-safety related structures and components subject to aging management review.

Corrective Action:

Corrective actions are implemented through the initiation of an Action Request (AR) in accordance with plant procedures established to implement the Corrective Action Management Policy and requirements of 10 CFR 50, Appendix B, Criterion XVI. Conditions adverse to quality, such as, failures, malfunctions, deviations, defective material and equipment, and nonconformances, are promptly identified and corrected. In the case of significant conditions adverse to quality, measures are implemented to ensure that the cause of the nonconformance is determined and that corrective action is taken to prevent recurrence. In addition, the root cause of the significant condition adverse to quality and the corrective action implemented are documented and reported to appropriate levels of management. The BSEP Corrective Action Program is consistent with the guidelines in the appendix to Volume 2 of NUREG-1801.

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 significant conditions adverse to quality. The BSEP Corrective Action Program includes the requirement that measures be taken to preclude repetition of significant conditions adverse to quality. These measures will include actions to verify effective implementation of proposed corrective actions. The confirmation process is part of the corrective action program and, for significant conditions adverse to quality, includes:

- reviews to assure proposed actions are adequate,
- tracking and reporting of open corrective actions,
- root cause determinations, and
- reviews of corrective action effectiveness.

The AR process is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of a follow-up AR. The BSEP confirmation process is consistent with the appendix to Volume 2 of NUREG-1801.

Administrative Controls:

Administrative controls that govern aging management activities are established within the document control procedures that implement: (1) industry standards related to administrative controls and quality assurance for the operational phase of nuclear power plants and (2) the requirements of 10 CFR 50, Appendix B, Criterion VI. The BSEP administrative controls process is consistent with the appendix to Volume 2 of NUREG-1801.

B.1.4 OPERATING EXPERIENCE

Industry operating experience (OE) was incorporated into the License Renewal process through a review of industry documents to identify aging effects and mechanisms that could challenge the intended function of systems and structures within the scope of License Renewal. Review of plant-specific OE was performed to identify aging effects experienced. The review of plant-specific OE involved electronic database searches of plant information. In addition, discussions with system engineers were conducted to identify additional aging concerns. Consideration of OE from industry and Progress Energy sources is accomplished by means of assessment activities performed under the BSEP QA Program.

OE regarding existing programs/activities, including past corrective actions resulting in program enhancements, was considered. This information provides objective evidence that the effects of aging have been, and will continue to be, adequately managed.

B.1.5 AGING MANAGEMENT PROGRAMS

The AMPs addressed in this Appendix are listed on Table B-1. Information on the table notes whether programs are either existing or new. Each AMP is addressed in the individual Subsections of Section B.2.

B.1.6 TIME-LIMITED AGING ANALYSES AGING MANAGEMENT PROGRAMS

Table B-1 also includes a listing of AMPs used to resolve Time-Limited Aging Analyses (TLAAs). Evaluation of TLAA-related AMPs in accordance with 10 CFR 54.21(c), are discussed in Section B.3.

B.2 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801 (GALL) programs and BSEP AMPs is shown on the following table.

TABLE B-1 CORRELATION OF NUREG-1801 AND BSEP AGING MANAGEMENT PROGRAMS

NUREG-1801 Number	NUREG-1801 Program	BSEP Program
GALL Report Chapter XI		
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program (Existing) See Subsection B.2.1.
XI.M2	Water Chemistry	Water Chemistry Program (Existing) See Subsection B.2.2.
XI.M3	Reactor Head Closure Studs	Reactor Head Closure Studs Program (Existing) See Subsection B.2.3.
XI.M4	BWR Vessel ID Attachment Welds	Refer to the plant-specific Reactor Vessel and Internals Structural Integrity Program below.
XI.M5	BWR Feedwater Nozzle	Refer to the plant-specific Reactor Vessel and Internals Structural Integrity Program below.
XI.M6	BWR Control Rod Drive Return Line Nozzle	Refer to the plant-specific Reactor Vessel and Internals Structural Integrity Program below.
XI.M7	BWR Stress Corrosion Cracking	BWR Stress Corrosion Cracking Program (Existing) See Subsection B.2.4.
XI.M8	BWR Penetrations	Refer to the plant-specific Reactor Vessel and Internals Structural Integrity Program below.
XI.M9	BWR Vessel Internals	Refer to the plant-specific Reactor Vessel and Internals Structural Integrity Program below.
XI.M10	Boric Acid Corrosion	Not applicable. BSEP does not use boric acid.
XI.M11	Nickel-Alloy Nozzles and Penetrations	Not applicable. BSEP does not employ nickel-alloy nozzles and penetrations in the reactor vessel or head.
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	The guidance of this program is addressed under the plant-specific Reactor Vessel and Internals Structural Integrity Program below.
XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	The guidance of this program is addressed under the plant-specific Reactor Vessel and Internals Structural Integrity Program below.
XI.M14	Loose Part Monitoring	Not applicable. BSEP does not have this equipment.
XI.M15	Neutron Noise Monitoring	Not applicable to BWRs.
XI.M16	PWR Vessel Internals	Not applicable to BWRs.

NUREG-1801 Number	NUREG-1801 Program	BSEP Program
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion Program (Existing) See Subsection B.2.5.
XI.M18	Bolting Integrity	Bolting Integrity Program (Existing) See Subsection B.2.6.
XI.M19	Steam Generator Tube Integrity	Not applicable to BWRs.
XI.M20	Open-Cycle Cooling Water System	Open-Cycle Cooling Water System Program (Existing) See Subsection B.2.7.
XI.M21	Closed-Cycle Cooling Water System	Closed-Cycle Cooling Water System Program (Existing) See Subsection B.2.8.
XI.M22	Boraflex Monitoring	Not applicable. BSEP does not use Boraflex.
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (Existing) See Subsection B.2.9.
XI.M24	Compressed Air Monitoring	Not credited for aging management.
XI.M25	BWR Reactor Water Cleanup System	Not credited for aging management.
XI.M26	Fire Protection	Fire Protection Program (Existing) See Subsection B.2.10.
XI.M27	Fire Water System	Fire Water System Program (Existing) See Subsection B.2.11.
XI.M28	Buried Piping and Tanks Surveillance	Not credited for aging management.
XI.M29	Aboveground Carbon Steel Tanks	Aboveground Carbon Steel Tanks Program (New) See Subsection B.2.12.
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry Program (Existing) See Subsection B.2.13.
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program (Existing) See Subsection B.2.14.
XI.M32	One-Time Inspection	One-Time Inspection Program (New) See Subsection B.2.15.
XI.M33	Selective Leaching of Materials	Selective Leaching of Materials Program (New) See Subsection B.2.16.
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program (New) See Subsection B.2.17.

NUREG-1801 Number	NUREG-1801 Program	BSEP Program
XI.S1	ASME Section XI, Subsection IWE	ASME Section XI, Subsection IWE Program (Existing) See Subsection B.2.18.
XI.S2	ASME Section XI, Subsection IWL	ASME Section XI, Subsection IWL Program (Existing) See Subsection B.2.19.
XI.S3	ASME Section XI, Subsection IWF	ASME Section XI, Subsection IWF Program (Existing) See Subsection B.2.20.
XI.S4	10 CFR Part 50, Appendix J	10 CFR Part 50, Appendix J Program (Existing) See Subsection B.2.21.
XI.S5	Masonry Wall Program	Masonry Wall Program (Existing) See Subsection B.2.22.
XI.S6	Structures Monitoring Program	Structures Monitoring Program (Existing) See Subsection B.2.23.
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Not credited for aging management
XI.S8	Protective Coating Monitoring and Maintenance Program	Protective Coating Monitoring and Maintenance Program (Existing) See Subsection B.2.24.
XI.E1	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program (New) See Subsection B.2.25.
XI.E2	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program (New) See Subsection B.2.26.
XI.E3	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program (New) See Subsection B.2.27.

NUREG-1801 Number	NUREG-1801 Program	BSEP Program
NUREG-1801 Chapter X		
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Reactor Coolant Pressure Boundary Fatigue Monitoring Program (Existing) See Subsection B.3.1.
X.S1	Concrete Containment Tendon Prestress	Not applicable. BSEP does not use prestressed tendons in the containment design.
X.E1	Environmental Qualification (EQ) of Electric Components	Environmental Qualification (EQ) Program (Existing) See Subsection B.3.2.
Plant-specific Programs		
NA	Plant-specific Program	Reactor Vessel and Internals Structural Integrity Program (Existing) See Subsection B.2.28.
NA	Plant-specific Program	Systems Monitoring Program (Existing) See Subsection B.2.29.
NA	Plant-specific Program	Preventive Maintenance Program (Existing) See Subsection B.2.30.
NA	Plant-specific Program	Phase Bus Aging Management Program (New) See Subsection B.2.31.
NA	Plant-specific Program	Fuel Pool Girder Tendon Inspection Program (Existing) See Subsection B.2.32.

B.2.1 ASME SECTION XI, INSERVICE INSPECTION, SUBSECTIONS IWB, IWC AND IWD PROGRAM

Program Description

The ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD Program consists of periodic volumetric, surface, and/or visual examination, and leakage test of Class 1, 2 and 3 pressure retaining components and their integral attachments to detect degradation of components and determine appropriate corrective actions. The Program was developed and prepared to meet the ASME Code, Section XI, 1989 Edition (no Addenda) and is subject to the limitations and modifications of 10 CFR 50.55a, with the exception of design and access provisions and pre-service examination requirements. BSEP is currently operating in accordance with the “Third Inspection Interval ISI Program Plan for Class 1, 2 and 3 Components and Their Supports.”

Certain inspection requirements have been modified by the BSEP Risk Informed (RI) ISI Program presented in EPRI Topical Report TR-112657. The RI ISI Program is described in a BSEP submittal, dated April 20, 2001, and corresponding NRC staff Safety Evaluation dated November 28, 2001. Refer to CP&L letter (D. DiCello) to NRC, dated April 20, 2001: “Brunswick Steam Electric Plant, Unit Nos. 1 and 2, Third 10-Year Inservice Inspection Program - Request for Approval of Risk-Informed Inservice Inspection Program,” and NRC letter (R. Correia) to CP&L (J. Keenan) dated November 28, 2001: “Brunswick Steam Electric Plant, Unit Nos. 1 and 2 – Safety Evaluation for the Risk-Informed Inservice Inspection (RI-ISI) Program (TAC Nos. MB1760 and MB1761).”

NUREG-1801 Consistency

The ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD Program is an existing program that is consistent with NUREG-1801, Section XI.M1. As noted in the description of the NUREG-1801 Section XI.M1 program, 10 CFR 50.55a governs the application of Codes and Standards. Therefore, differences between the BSEP Code of record and the Code edition specified in NUREG-1801 are not considered to be an exception to NUREG-1801. In addition, exceptions to ASME Code requirements that have been granted by approved Code Cases or relief requests are not considered to be exceptions to NUREG-1801 criteria.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD Program is implemented and maintained in accordance with the general requirements for engineering programs. This provides assurance that the Program is effectively implemented to meet regulatory, process, and procedure requirements, including periodic reviews; qualified personnel are assigned as program managers, and are given authority and responsibility to implement the Program; and adequate resources are committed to Program activities.

A search of condition reports and ISI history, including self-assessments and inspections, was conducted and showed the BSEP ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD Program to be critically monitored, effective and continually improving. Based on these results, the OE provides evidence that the Program and maintenance practices are ensuring the continuing integrity of the ISI Class 1, 2 and 3 components.

Conclusion

The BSEP ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD Program is consistent with NUREG-1801, Section XI.M1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD. Implementation of the Program provides reasonable assurance that the aging effects will be managed such that the ISI Class 1, 2 and 3 components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis (CLB) for the period of extended operation.

B.2.2 WATER CHEMISTRY PROGRAM

Program Description

The main objective of the Water Chemistry Program is to minimize loss of material, cracking, and flow blockage. The Water Chemistry Program is consistent with and relies on monitoring and control of water chemistry based on the latest version of the BWR Water Chemistry Guidelines. This version contains guidelines for reactor water, condensate and feedwater, for control rod drive cooling water, and other systems such as spent fuel pool water. The Water Chemistry Program includes periodic monitoring, control, and mitigation of known detrimental contaminants below the levels known to result in loss of material, cracking, and flow blockage.

NUREG-1801 Consistency

The Water Chemistry Program is an existing program and is consistent, with exceptions, to NUREG-1801, Section XI.M2.

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

- **Scope of Program**
  NUREG-1801 recommends that water chemistry be controlled in accordance with BWRVIP-29. BWRVIP-29 references the 1993 revision of EPRI Report TR-103515, "BWR Water Chemistry Guidelines." The BSEP Water Chemistry Program is based on the latest version of the BWRVIP Water Chemistry Guidelines (currently BWRVIP-79 EPRI Report TR-103515-R2, which is the 2000 Revision of "BWR Water Chemistry Guidelines"). EPRI incorporates new information to develop proactive plant-specific water chemistry programs to minimize intergranular stress corrosion cracking (IGSCC). EPRI periodically updates the water chemistry guidelines, as new information becomes available. The BSEP Water Chemistry Program will be updated as revisions to the guidelines are released. In the “License Renewal Safety Evaluation Report for the Peach Bottom Atomic Power Station, Units 2 and 3” (Accession No. ML030370189), the NRC found EPRI TR-103515-R2 acceptable because the Program is based on updated industry experience and plant-specific and industry-wide OE confirms the effectiveness of the Water Chemistry Program.

- **Preventive Actions**
  The BSEP Water Chemistry Program is credited with managing loss of material due to galvanic corrosion and flow blockage due to fouling. Certain Aging Management Reviews (AMRs) credit this Program for mitigating loss of material due to galvanic corrosion or flow blockage due to fouling. Galvanic corrosion is

managed using the same methods applied for crevice corrosion, general corrosion, pitting corrosion, and stress corrosion cracking. The parameter limits in effect are based upon the latest version of the BWR Water Chemistry Guidelines. These parameters include, but are not limited to, chloride, specific conductivity, sulfate, nitrite, tolyltriazole, dissolved oxygen, and silica. Operation below these parameter limits helps to control electrolytes. In total, these controls have been shown by OE to have been effective in minimizing each form of electrochemical corrosion, including galvanic corrosion, pitting corrosion, crevice corrosion, general corrosion, and SCC. Flow blockage due to fouling is managed by controlling the creation of corrosion products.

- **Parameters Monitored/Inspected**
  The BSEP Water Chemistry Program does not require the monitoring of hydrogen peroxide.

- **Monitoring and Trending**
  The latest version of the BWR Water Chemistry Guidelines may specify slightly different sampling frequencies than those specified in BWRVIP-29. In the "License Renewal Safety Evaluation Report for the Peach Bottom Atomic Power Station, Units 2 and 3" (Accession No. ML030370189), the NRC found EPRI TR-103515-R2 acceptable because the Program is based on updated industry experience. BSEP and industry-wide OE confirms the effectiveness of the Water Chemistry Program.

Enhancements

None.

Operating Experience

The EPRI guideline documents have been developed based on plant experience and have been shown to be effective over time with their widespread use in the industry. The specific examples of BWR industry OE are as follows:

- Intergranular stress corrosion cracking has occurred in small and large-diameter BWR piping made of austenitic stainless steels and nickel-base alloys.
- Significant cracking has occurred in piping welds of recirculation, core spray, residual heat removal, and reactor water cleanup systems.
- IGSCC has also occurred in a number of vessel internal components, including the core shroud, access hole cover, top guide, and core spray spargers.
- No occurrence of stress corrosion cracking (SCC) in piping and other components in standby liquid control systems exposed to sodium pentaborate solution has ever been reported.

The OE at BSEP is similar to that of the industry. Cracking due to IGSCC was found in reactor recirculation, reactor water cleanup, and jet pump instrumentation system piping.

The BSEP Water Chemistry Program is currently based on EPRI TR-103515-R2 (BWRVIP-79), which is the 2000 Revision of "BWR Water Chemistry Guidelines". EPRI periodically updates the water chemistry guidelines, as new information becomes available. The BSEP Water Chemistry Program will be updated as revisions to the guidelines are released, to develop a more proactive program that minimizes age-related degradation.

The OE review of the BSEP Water Chemistry Program concluded that this Program is continually upgraded based on industry experience and research. These continuous improvements assure the capability of the BSEP Water Chemistry Program to support the safe operation of BSEP throughout the extended period of operation.

Conclusion

The continued implementation of the BSEP Water Chemistry Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.3 REACTOR HEAD CLOSURE STUDS PROGRAM

Program Description

The Reactor Head Closure Studs Program is credited for aging management of reactor head closure studs and stud components. The closure studs, nuts, bushings, and washers are included within the scope of the ASME Section XI inservice Inspection, Subsections IWB, IWC, and IWD Program (refer to Subsection B.2.1). While BSEP is not committed to Regulatory Guide 1.65, the Reactor Head Closure Studs Program preventive measures are consistent with the recommendations of the Regulatory Guide.

Aging effects/mechanisms of concern are cracking due to stress corrosion cracking, and loss of material due to (1) general corrosion, (2) crevice corrosion, and (3) pitting corrosion.

NUREG-1801 Consistency

The Reactor Head Closure Studs Program is an existing program and is consistent with GALL Section XI.M3.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The Reactor Head Closure Studs Program is implemented through the ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD Program which monitors the condition of the closure studs and stud components. The Reactor Head Closure Studs Program is implemented and maintained in accordance with the general requirements for engineering programs. This provides assurance that the Program is effectively implemented to meet regulatory, process, and procedure requirements, including periodic reviews; qualified personnel are assigned as program managers, and are given authority and responsibility to implement the Program; and adequate resources are committed to Program activities.

A search of condition reports and ISI history was conducted, and no reports documenting deficiencies or problems with vessel head closure studs or stud components, or the Reactor Head Closure Studs Program, were found. Based on these results, the OE provides evidence that the Program and maintenance practices are ensuring the continuing integrity of the reactor head closure studs and stud components.

Conclusion

Implementation of the Reactor Head Closure Studs Program provides reasonable assurance that the aging effects will be managed such that the reactor head closure studs and stud components will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.4 BWR STRESS CORROSION CRACKING PROGRAM

Program Description

The BWR Stress Corrosion Cracking Program manages intergranular stress corrosion cracking (IGSCC) in reactor coolant pressure boundary components made of stainless steel. The Program includes:

- Preventive measures to mitigate SCC (including IGSCC). The comprehensive program outlined in NRC Generic Letter (GL) 88-01 and NUREG-0313 and in the staff approved BWRVIP-75 has been implemented. This comprehensive program addresses the mitigating measures for stress corrosion cracking and intergranular stress corrosion cracking. Preventive methodologies include piping replacement with IGSCC resistant stainless steel. Preventive measures have included heat sink welding, induction heating, and mechanical stress improvement. The BSEP Water Chemistry Program controls water chemistry within parameters that prevent, minimize, and mitigate intergranular stress corrosion cracking.
- Inspection and flaw evaluation to monitor SCC (including IGSCC) and its effects. The staff-approved BWRVIP-75 report allows for modifications of inspection scope in the GL 88-01 program. This program detects degradation due to SCC (including IGSCC). The BWR Stress Corrosion Cracking Program is consistent with: (1) NUREG-0313, “Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping,” Revision 2; (2) BWRVIP-75, “Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules;” and (3) Nuclear Regulatory Commission GL 88-01, “NRC Position on Intergranular Stress Corrosion Cracking in BWR Austenitic Stainless Steel Piping,” and its Supplement 1. Category A IGSCC-susceptible welds are subsumed into the Risk-Informed ISI Program.

NUREG-1801 Consistency

The BWR Stress Corrosion Cracking Program is an existing program that is consistent with NUREG-1801, Section XI.M7.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

BSEP, as well as most of the BWR fleet of reactors, has experienced IGSCC of austenitic stainless steel piping. The implementation of the comprehensive program outlined in NRC GL 88-01, NUREG-0313, and in the staff-approved BWRVIP-75, in conjunction with the Water Chemistry Program, has been effective in managing SCC (including IGSCC). The BWR Stress Corrosion Cracking Program has been shown to be effective at identifying the aging effect of cracking due to SCC (including IGSCC) so that repairs or replacements are implemented prior to failure.

Conclusion

The continued implementation of the BWR Stress Corrosion Cracking Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.5 FLOW-ACCELERATED CORROSION PROGRAM

Program Description

The FAC Program provides for prediction, inspection, and monitoring of piping and fittings for a loss of material aging effect due to flow-accelerated corrosion so that timely and appropriate action may be taken to minimize the probability of experiencing a FAC-induced consequential leak or rupture. The FAC Program elements are based on the recommendations identified in NSAC-202L-R2, "Recommendations for an Effective Flow-Accelerated Corrosion Program," which requires controls to assure the structural integrity of carbon steel lines containing high-energy fluids (two phase as well as single phase). The BSEP FAC Program manages loss of material in carbon steel piping and fittings.

NUREG-1801 Consistency

The Flow-Accelerated Corrosion Program is an existing program that, following enhancement, will be consistent with an exception to NUREG-1801, Section XI.M17.

Exceptions to NUREG-1801

Program Elements Affected

- **Scope of Program**
  NSAC-202L-R2 advises that portions of systems with water containing components greater than 200°F can be excluded from further FAC susceptibility evaluation if they contain superheated steam with no moisture content. The BSEP FAC susceptibility analyses allow for the exclusion of components operating with superheat or with a steam quality exceeding 99.5% from further susceptibility evaluation. Typical BWR steam qualities are in excess of 99.5%, but some moisture is present.

  BSEP FAC susceptibility analyses predate issuance NSAC-202L-R2. Experience with FAC modeling has shown that piping with high steam quality (>99.5%) yields very low predicted wear rates (<1.5 mils/year) and very high estimated remaining life projections. This exception reduces the amount of steam system piping modeled explicitly with CHECWORKS, but does not alter the primary inspection focus in accordance with NSAC-202L-R2.

Enhancements

Prior to the period of extended operation, the below-listed enhancement will be implemented in the following program element:

<u>Program Element Affected</u>

- **Scope of Program**
  Update the BSEP FAC susceptibility analyses to include additional components potentially susceptible to FAC.

Operating Experience

Wall thinning problems in single-phase systems have occurred throughout the industry in feedwater and condensate systems, and in two-phase piping in extraction steam lines and moisture separator reheater and feedwater heater drains. The BSEP HPCI and RCIC steam drain lines have experienced wall thinning due to FAC. The FAC Program was originally outlined in NUREG-1344 and implemented through GL 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning." The Program has evolved through industry experience and is now described in NSAC-202L-R2. Application of the FAC Program has resulted in replacement of piping identified as being subject to FAC before experiencing a consequential leak or rupture. The FAC Program has provided an effective means of ensuring the structural integrity of high-energy carbon steel systems. The NRC has audited industry programs based on the EPRI methodology at several plants and has determined that these activities can provide a good prediction of the onset of FAC so that timely corrective actions can be undertaken.

Conclusion

The BSEP FAC Program activities predict, detect, and monitor wall thinning in piping due to flow accelerated corrosion. The FAC Program is based on the EPRI guidelines in NSAC-202L-R2, "Recommendations for an Effective Flow-Accelerated Corrosion Program." Administrative controls ensure that the FAC Program is implemented as required by NRC GL 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning".

Based on the above, there is reasonable assurance that the BSEP FAC Program will continue to adequately manage the aging effects due to flow accelerated corrosion in carbon steel piping systems containing high energy fluids to maintain intended functions consistent with the CLB for the period of extended operation.

B.2.6 BOLTING INTEGRITY PROGRAM

Program Description

The Bolting Integrity Program addresses aging management requirements for bolting on mechanical components within the scope of License Renewal. The BSEP Bolting Integrity Program utilizes industry recommendations and EPRI guidance which considers material properties, joint/gasket design, chemical control, service requirements and industry/site operating experience in specifying torque and closure requirements. The program relies on recommendations for a Bolting Integrity Program, as delineated in NUREG-1339, “Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants,” and industry recommendations, as delineated in the Electric Power Research Institute (EPRI) NP-5769, “Degradation and Failure of Bolting in Nuclear Power Plants,” and TR-104213, “Bolted Joint Maintenance & Application Guide,” for pressure retaining bolting within the scope of License Renewal. While the AMP discussion reconciles structural bolting issues presented in the GALL for the sake of completeness, this AMP does not prescribe aging management of structural bolting.

NUREG-1801 Consistency

The Bolting Integrity Program is an existing program that, following enhancement, will be consistent with exceptions with NUREG-1801, Section XI.M18.

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

- **Scope of Program**
  The Bolting Integrity Program is not utilized to address aging management requirements for structural bolting. Structural bolting is discussed herein only in response to specific issues raised by NUREG-1801 in its Bolting Integrity Program description. Implementation of aging management requirements for structural bolting is accomplished under the ASME Section XI, Subsection IWF Program and the Structures Monitoring Program.

- **Parameters Monitored/Inspected**
  The Bolting Integrity Program is not utilized to prescribe monitoring and trending for bolting within Section XI boundaries. These activities are addressed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program.

  The Bolting Integrity Program is not utilized to address aging management requirements for structural bolting. Structural bolting is discussed herein only in response to specific issues raised by NUREG-1801 in its Bolting Integrity Program description. Implementation of aging management requirements for structural bolting is accomplished under the ASME Section XI, Subsection IWF Program and the Structures Monitoring Program.

- **Detection of Aging Effects**
  The Bolting Integrity Program is not utilized to prescribe acceptance criteria for bolting within Section XI boundaries. These activities are addressed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program.

  The Bolting Integrity Program is not utilized to address aging management requirements for structural bolting, including Nuclear Steam Supply System (NSSS) supports. Structural bolting is discussed herein only in response to specific issues raised by NUREG-1801 in its Bolting Integrity Program description. Implementation of aging management requirements for structural bolting is accomplished under the ASME Section XI, Subsection IWF Program and the Structures Monitoring Program.

- **Monitoring and Trending**
  Inspections of Section XI bolting is performed under the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, and not addressed in the Bolting Integrity Program.

  The Bolting Integrity Program does not specify leakage monitoring requirements for components outside Section XI boundaries.

- **Acceptance Criteria**
  Inspections of Section XI bolting is performed under the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, and not addressed in the Bolting Integrity Program.

  The Bolting Integrity Program does not specify acceptance criteria requirements for components outside Section XI boundaries.

- **Corrective Actions**
  The Bolting Integrity Program is not utilized to prescribe corrective actions for bolting within Section XI boundaries. These activities are addressed by the applicable ASME Section XI Program.

  The Bolting Integrity Program does not address structural bolting. Corrective actions regarding structural bolting is addressed by the Structures Monitoring Program or the ASME Section XI, Subsection IWF Program, as applicable.

Enhancements

Prior to the period of extended operation, the below-listed enhancement will be implemented in the following program element:

Program Element Affected

- **Preventive Actions**
  A precautionary note will be added to plant bolting guidelines to limit the sulfur content of compounds used on bolted connections.

Operating Experience

The BSEP Bolting Integrity Program is based on industry guidance which considers OE. BSEP OE includes verification of fastener material properties in accordance with NRC Bulletin 87-02, including sample-based testing that verified that A193, B7 bolting material specifications were not only within manufacturer's specifications, but also well below the 150 ksi threshold associated with cracking.

The OE review shows that the BSEP Bolting Integrity Program is continually upgraded based on industry experience, research, and routine program performance. The Program, through its continual improvement, assures the capability of mechanical bolting to support the safe operation of BSEP throughout the extended period of operation.

Conclusion

Continued implementation of the BSEP Bolting Integrity Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.7 OPEN-CYCLE COOLING WATER SYSTEM PROGRAM

Program Description

The BSEP Open Cycle Cooling Water System Program relies on implementation of the recommendations of the NRC GL 89-13, “Service Water System Problems Affecting Safety-Related Equipment,” to ensure that the effects of aging on the Open Cycle Cooling Water (OCCW) (or Service Water) will be managed for the extended period of operation. The Program includes surveillance and control techniques to manage aging effects caused by biofouling, corrosion, erosion, protective coating failures, and silting in the OCCW System or structures and components serviced by the OCCW System.

The OCCW Program addresses portions of the Service Water (SW) Systems of BSEP Unit 1 and Unit 2. The Program scope includes safety related portions of both the nuclear and conventional SW headers. The OCCW portion of the Residual Heat Removal Service Water (RHR-SW), Diesel Generator Heat Exchangers and associated Service Water piping/components, and other safety related heat loads cooled by the SW System are also included in the scope of the Program. Additionally, the Program is credited with aging management of limited non-safety related piping and components included in the scope of license renewal. Specifically, this includes the SW discharge header, and piping/components associated with cooling water to and from the RBCCW Heat Exchangers.

NUREG-1801 Consistency

The Open-Cycle Cooling Water System Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M20.

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the below-listed enhancements will be implemented in the following program elements:

<u>Program Elements Affected</u>

- **Scope of Program**
  The scope of the Open-Cycle Cooling Water System Program will include portions of the SW System credited in the aging management review, including RBCCW piping, discharge piping to the weir, and piping to and from Diesel Generators (including expansion joints).

- **Parameters Monitored/Inspected**
  Inspections will include locations where throttling of changes in flow direction might result in erosion of copper-nickel piping.

- **Detection of Aging Effects**
  The following enhancements will be provided: (1) the RHR Heat Exchangers will be subject to eddy current testing, (2) verification of SW pump lube oil cooler flow and heat transfer effectiveness and replacement of RHR Seal Coolers will be incorporated into procedures, and (3) inspection of a representative sample of SW pump casings will be performed.

- **Monitoring and Trending**
  The RHR Heat Exchanger eddy current test results will be compared to previous baseline testing to determine material condition and need for ongoing monitoring.

Operating Experience

A review of recent system operating history shows that the Open-Cycle Cooling Water System Program has been effective in identifying and mitigating leaks, as well as preventing equipment failures related to fouling and flow blockage. A review of plant and industry OE has identified localized erosion of system components in throttling applications, corrosion and silting of RHR Seal Coolers and corrosion and fouling of RHR Pump Strainers as items of concern. Requirements for addressing these issues are formalized in the Open-Cycle Cooling Water System Program.

Conclusion

Based on the above, continued implementation of the Open-Cycle Cooling Water System Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.8 CLOSED-CYCLE COOLING WATER SYSTEM PROGRAM

Program Description

The Closed-cycle Cooling Water System Program addresses aging management of components in the Reactor Building Closed Cooling Water (RBCCW) and Diesel Generator (DG) Jacket Water Cooling Systems. These systems are closed cooling loops with controlled chemistry, consistent with the NUREG-1801 description of a closed-cycle cooling water system. The Program relies on maintenance of system corrosion inhibitor concentrations within specified limits of Electric Power Research Institute (EPRI) TR-107396, "Closed Cooling Water Chemistry Guideline," to minimize corrosion. Surveillance testing and inspection in accordance with standards in EPRI TR-107396 for closed-cycle cooling water (CCCW) systems is performed to evaluate system and component performance. These measures will ensure that the CCCW system and components serviced by the CCCW system are performing their functions acceptably.

NUREG-1801 Consistency

The Closed Cycle Cooling Water Chemistry Program is an existing program and, following enhancement, will be consistent with NUREG-1801, Section XI.M21.

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the below-listed enhancements will be implemented in the following program elements:

<u>Program Elements Affected</u>

- **Parameters Monitored/Inspected**
  External inspections will be performed of cooling fins and surfaces of the DG combustion air intercoolers for corrosion or fouling.

- **Detection of Aging Effects**
  Preventive Maintenance activities include inspections of DG combustion air intercoolers and heat exchangers. These activities will ensure that applicable potential aging effects are identified.

Operating Experience

An OE review found no incidence of age-related degradation associated with BSEP Closed Cooling Water Systems.

Conclusion

The continued implementation of the BSEP Closed Cooling Water System Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.9 INSPECTION OF OVERHEAD HEAVY LOAD AND LIGHT LOAD HANDLING SYSTEMS PROGRAM

Program Description

The Inspection of Overhead Heavy Load and Light Load Handling Systems Program provides for the inspection of the Reactor Building Bridge Cranes, Refueling Platforms, and the Intake Structure Gantry Crane. The inspections monitor structural members for the absence or signs of corrosion other than minor surface corrosion and crane rails for abnormal wear. The inspections are performed annually for the Reactor Building Bridge Cranes and the Intake Structure Gantry Crane, and every fuel cycle for the Refueling Platforms. The Diesel Generator Building Cranes do not credit this Program for aging management activities, because they are addressed as structural steel (monorails) and managed under the Structures Monitoring Program.

NUREG-1801 Consistency

The Inspection of Overhead Heavy Load and Light Load Handling Systems Program is an existing AMP that, following enhancement, will be consistent with NUREG-1801, Section XI.M23.

Exceptions to NUREG-1801

None.

Enhancements

The administrative controls for the Program will be enhanced to assure the following improvements are addressed prior to the period of extended operation:

<u>Program Elements Affected</u>

- **Scope of Program**
  Revise administrative controls to include all cranes within the scope of License Renewal, not only the safety-related cranes.

- **Parameters Monitored/Inspected**
  Revise administrative controls to require Maintenance to forward completed inspection reports to the responsible engineer.

- **Detection of Aging Effects**
  Revise administrative controls to address the following: (1) include in the Program all cranes within the scope of License Renewal, (2) specify an annual inspection frequency for the Reactor Building Bridge Cranes and the Intake

Structure Gantry Crane, and every fuel cycle for the Refuel Platforms, (3) allow use of maintenance crane inspections as input for the condition monitoring of License Renewal cranes, and (4) include inspection of structural component corrosion and monitoring crane rails for abnormal wear.

Operating Experience

Based on review of plant history, BSEP has identified numerous issues involving corrosion of structural members, crane rail wear, operations, inspections, and regulatory compliance through a review of the corrective action process. Crane monitoring programs are continually being upgraded based upon industry and Progress Energy plant experience. This intrusive and proactive approach to the operation and management of cranes verifies the effectiveness of those procedures used to implement the Inspection of Overhead Heavy Load and Light Load Handling Systems Program.

Conclusion

The Inspection of Overhead Heavy Load and Light Load Handling Systems Program provides reasonable assurance that the aging effects of corrosion of structural components and crane rail wear are adequately managed so that the intended functions of cranes within the scope of License Renewal are maintained during the period of extended operation.

B.2.10 FIRE PROTECTION PROGRAM

Program Description

The Fire Protection Program is credited for aging management of the fire protection components (penetration seals, barrier walls, ceiling and floors, and fire doors, gaseous (Halon/CO_2) fire suppression systems, the diesel-driven fire pump fuel oil supply line, and the fire pump diesel engine heat exchanger at BSEP. The Program is implemented through various plant procedures and is proven to adequately manage the aging effects associated with the subject components.

NUREG-1801 Consistency

The Fire Protection Program is an existing program that is consistent with exceptions to NUREG-1801, Section XI.M26 (as modified by NRC ISG-04).

Exceptions to NUREG-1801

Program Elements Affected

- **Parameters Monitored/Inspected**
  (1) The initial penetration seal sample size utilized by BSEP is less than the ISG recommended sample size of 10%. The BSEP sample size is less than the recommended size of 10%; however, based on plant operating history the sample provides reasonable assurance the entire population is adequately monitored.

  (2) The BSEP Fire Protection Program does not require visual inspection of "each type of penetration seal" but rather "a statistical sample of penetration seals in each affected building (or group of buildings)." However, this sampling method is determined to be both acceptable for the BSEP configuration, and adequate to assure the capability of the penetration seals to preserve from fire the safe shutdown capability of BSEP. Based on the sampling process and frequency of inspections, a representative sampling is assured.

  (3) The ISG-modified program element recommends system functional testing at least once every six months, the subject systems are verified as being properly charged every six months, but functional testing is performed less frequently. The halon system is functionally tested annually, and the CO_2 system is functionally tested every 18 months. Although these are less frequent than specified by the ISG, testing is sufficient to ensure the systems will perform their intended functions, as evidenced by the operational history of the systems. The BSEP gaseous suppression system functional testing procedures include the Program Element's specified operability criteria. Furthermore, the BSEP specific

frequency of gaseous suppression system functional testing has proven, based on OE, to be adequate to assure the continued capability of the systems to preserve from fire the safe shutdown capability of BSEP.

- **Detection of Aging Effects**
  (1) The initial penetration seal sample size utilized by BSEP is less than the ISG recommended sample size of 10%. Refer to the discussion of this exception under the Parameters Monitored/Inspected element above.

  (2) The BSEP Fire Protection Program does not require visual inspection of "each type of penetration seal" but rather "a statistical sample of penetration seals in each affected building (or group of buildings)." Refer to the discussion of this exception under the Parameters Monitored/Inspected element above.

  (3) The ISG-modified program element recommends functional testing at least once every six months, the subject systems are verified as being properly charged every six months, but functional testing is performed less frequently. The halon system is functionally tested annually and the CO_2 system is functionally tested every 18 months. Refer to the discussion of this exception under the Parameters Monitored/Inspected element above.

  (4) General visual inspections are performed for the subject components rather than a VT-1 or equivalent inspection; however, the applicable inspection criteria are sufficient to assure detection of aging effects for the components.

Enhancements

None.

Operating Experience

The Fire Protection Program is maintained in accordance with BSEP requirements for engineering programs. This provides assurance that the Program is effectively implemented to meet regulatory, process, and procedure requirements, including periodic reviews; qualified personnel are assigned as program managers, and are given authority and responsibility to implement the Program; and adequate resources are committed to Program activities. The operating history and assessment results for the Program show it is an effective means of ensuring the preservation from fire of the safe shutdown capability of BSEP. Since these measures assure continual improvement of the Program as prompted by industry experience, research, and routine program performance, the capability of the Fire Protection Program to support the safe operation of BSEP throughout the extended period of operation is therefore assured.

Conclusion

Continued implementation of the Fire Protection Program provides reasonable assurance that the components/commodities associated with the fire protection structural components, gaseous (Halon/CO_2) fire suppression systems, the diesel-driven fire pump fuel oil supply line, and the fire pump diesel engine heat exchanger, will perform their intended functions for the period of extended operation.

B.2.11 FIRE WATER SYSTEM PROGRAM

Program Description

The Fire Water System Program includes system pressure monitoring, inspections, and periodic testing in accordance with applicable NFPA commitments. Periodic visual inspection of overall system condition and inspections of the internal surfaces of system piping, upon each entry to the system for routine or corrective maintenance, provide an effective means to determine whether corrosion and biofouling are occurring. These inspections include the sprinkler heads and assure that corrosion products that could block flow of the sprinkler heads are not accumulating These measures will allow timely corrective action in the event of system degradation to ensure the capability of the water-based Fire Suppression System to perform its intended function.

NUREG-1801 Consistency

The Fire Water System Program is an existing program that, following enhancement, will be consistent in its entirety with the criteria of NUREG-1801, Section XI.M27 (as amended by NRC ISG-04).

Exceptions to NUREG-1801

None.

Enhancements

The following enhancements will be implemented prior to the period of extended operation:

<u>Program Elements Affected</u>

- **Parameters Monitored/Inspected**
  The Fire Protection Program administrative control documents will be updated to incorporate a requirement to periodically tabulate and assess results from the initial 40-year service life tests and inspections. This information will be used to determine whether a representative sample of such results has been collected and, consequently, whether expansion of scope and subsequent test/inspection means and intervals, incorporating provisions for non-intrusive testing or other corrective action is warranted.

- **Detection of Aging Effects**
  A majority of the sprinkler heads have been replaced within the last ten years. The remainder (located in the Diesel Generator Building and RHR rooms) will be replaced prior to 50 years of service. This will assure all the sprinkler heads will

have less than 50 years service throughout the extended period of operation thereby obviating the need for any extended service inspections.

- **Monitoring and Trending**
  The Fire Protection Program administrative control documents will be updated to incorporate a requirement to periodically tabulate and assess results from the initial 40-year service life tests and inspections. This information will be used to determine whether a representative sample of such results has been collected and, consequently, whether expansion of scope and subsequent test/inspection means and intervals, incorporating provisions for non-intrusive testing or other corrective action is warranted.

Operating Experience

The Fire Water System Program is maintained in accordance with BSEP engineering programs requirements. This provides assurance that the Program is effectively implemented to meet regulatory, process, and procedure requirements, including periodic reviews; qualified personnel are assigned as program managers, and are given authority and responsibility to implement the Program; and adequate resources are committed to Program activities. The operating history and assessment results for the Fire Water System Program show it is an effective means of ensuring the preservation from fire of the safe shutdown capability of BSEP. Since these measures assure continual improvement of the Program as prompted by industry experience and research and routine program performance, the capability of the Program to support the safe operation of BSEP throughout the extended period of operation is therefore assured.

Conclusion

The Fire Water System Program is consistent with NUREG-1801 Section XI.M27, as amended by NRC ISG-04, “Aging Management of Fire Protection Systems for License Renewal,” and continued implementation of the Program assures that the components/commodities associated with the Water-Based Fire Suppression System will perform their intended functions for the period of extended operation.

B.2.12 ABOVEGROUND CARBON STEEL TANKS PROGRAM

Program Description

The purpose of the Aboveground Carbon Steel Tanks Program is to perform inspections of tanks to provide reasonable assurance that the components perform their intended function consistent with the CLB throughout the period of extended operation. The Program manages aging effects of loss of material for external surfaces and inaccessible locations of the Main Fuel Oil Storage Tank, Condensate Storage Tanks and Fire Protection Water Storage Tank. These tanks are constructed of carbon steel.

This Program relies on periodic system walkdowns and inspections to monitor the condition of these tanks. This includes an assessment of the condition of tank surfaces protected by paint or coating and the caulking at the concrete foundation interface. The paint is not credited with performing a preventive function for aging management. For inaccessible surfaces, such as the tank bottom, one-time thickness measurements will be performed from inside the tank to assess the tank bottom condition. Using one-time inspections of tank bottoms ensures degradation or significant loss of material will not occur in inaccessible locations. In addition, the Condensate Storage Tanks and Fire Protection Water Storage Tank will be subject to a one-time inspection of all interior surfaces. The Systems Monitoring Program will provide guidance to ensure that the external surfaces of the subject tanks are periodically inspected.

NUREG-1801 Consistency

The Aboveground Carbon Steel Tanks Program is a new program that is consistent with NUREG-1801, Section XI.M29.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

Main Fuel Oil Storage Tank - NDE testing has been conducted on the Emergency Fire Pump Diesel Fuel Oil Storage Tank and each of the four DG 4-day Fuel Oil Storage Tanks. Problems relating to tank wall thickness degradation were not found on the subject tanks. This OE highlights the effectiveness of the Fuel Oil Chemistry Program in minimizing the loss of material within the Fuel Oil System.

Condensate Storage Tanks – During inside tank inspections, corrosion products and coating film degradation were noted, with the shell wall thickness readings acceptable. The shell plates have experienced negligible corrosion. On the CST bottom plates, corrosion indications were noted on both the Unit 1 and Unit 2 tanks. In addition, the exterior of each CST has been inspected. External tank surface corrosion was identified on small portions of the shell wall and evaluated as acceptable.

Fire Protection Water Storage Tank - Inspection by a vendor determined that the tank is structurally sound. The tank foundation has some cracking, and the interior coating has some primer degradation; both conditions have been evaluated as acceptable.

Conclusion

Based on the above, the implementation of the Aboveground Carbon Steel Tanks Program provides reasonable assurance that the aging effects will be managed such that the tanks within the scope of the Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.13 FUEL OIL CHEMISTRY PROGRAM

Program Description

Fuel oil quality is maintained by monitoring and controlling fuel oil contamination in accordance with the guidelines of American Society for Testing Materials (ASTM) Standards D1796-77 (as specified in ASTM D975-88), D2276-89, and D4057-88. These Standards are in accordance with the Bases for BSEP Technical Specification Surveillance Requirement 3.8.3.2 for fuel oil testing. Exposure to fuel oil contaminants, such as water and microbiological organisms is minimized by verifying the quality of new oil before its introduction into the storage tanks and by periodic sampling to assure that the tanks are free of water and particulates. The effectiveness of the Program is verified using thickness measurement of tank bottom surfaces to ensure that significant degradation is not occurring and to verify the component intended function will be maintained during the extended period of operation.

NUREG-1801 Consistency

The Fuel Oil Chemistry Program is an existing program that, following enhancement, will be consistent with exceptions to NUREG-1801, Section XI.M30.

Exceptions to NUREG-1801

Program Elements Affected

- **Scope of Program**
  In addition to storage tanks, the BSEP Fuel Oil Chemistry Program is used to manage aging effects on all in-scope system components “wetted” by fuel oil. This results in additional materials being in scope beyond those in NUREG-1801.

  NUREG-1801, Section XI.M30, states that “the program is focused on managing the conditions that cause general, pitting, and microbiologically influenced corrosion (MIC) of the diesel fuel tank internal surfaces. The program serves to reduce the potential of exposure of the tank internal surface to fuel oil contaminated with water and microbiological organisms”. This reasoning can also be extended to managing the aging of metallic components in a fuel oil environment. The BSEP Fuel Oil Chemistry Program also specifies that new fuel be tested in accordance ASTM D130-94 to assure fuel oil corrosion of copper alloy components in the diesel system is minimal.

  These test and controls ensure that Fuel Oil System components are exposed to contaminate-free fuel oil with minimal potential to corrode the interior surfaces of carbon steel, copper alloy and stainless steel components.

- **Preventive Actions**
  The BSEP Fuel Oil Chemistry Program does not currently use biocides, stabilizers, and corrosion inhibitors.

  NUREG-1801, Section XI.M30, states that the quality of fuel oil is maintained by additions of biocides to minimize biological activity, stabilizers to prevent biological breakdown of the diesel fuel, and corrosion inhibitors to mitigate corrosion. Fuel is purchased to ASTM D975-88 requirements that address stability and corrosion. Biocides, stabilizers, and corrosion inhibiting additives have not been used at BSEP. Based on operating history and fuel oil management activities, the addition of biocides, biological stabilizers, and corrosion inhibitors into stored fuel oil at BSEP is not necessary; however the option is retained on an as needed basis.

  Sample trends do not warrant periodic cleaning of in-scope tanks. NUREG-1801, Section XI.M30, notes, “Periodic cleaning of a tank allows removal of sediments, and periodic draining of water collected at the bottom of a tank minimizes the amount of water and the length of contact time.” The BSEP Main FO Storage Tank is a free-standing, outdoor, carbon steel tank with a low point sump design feature to accumulate potential water and sediment. Fuel oil chemistry sampling is performed at various levels within the tank, including the sump. The tap for fuel transfer is above the level of the sump insuring that oil transferred to other tanks is free of water and sediment. The DG 4-day FO Storage Tanks, the diesel generator day tanks (Saddle Tanks), and the diesel-driven fire pump day tank are all housed in sheltered environments that are not subject to significant water intrusion or condensation. Particulate and water accumulation is checked every 31 days for the Main FO Storage Tank, the DG 4-day FO Storage Tanks, the diesel generator Saddle Tanks and every 92 days for the diesel-driven fire pump tank. In addition, the 4-day and Saddle Tanks are inspected for water accumulation after every diesel run of greater than one hour. Fuel added to the Main FO Storage Tank is tested for water and sediment during receipt inspection. Fuel Oil system design, procurement practices, and testing requirements assure that fuel oil is free of water, sediment, and particulates. There currently is no Program requirement for periodic cleaning of in-scope tanks because the sampling trends have not indicated accumulation of water, sediment, or particulates has been a problem. Samples are drawn at or near the bottom of the tanks such that accumulation of water, sediment, or particulates would be observed. Based on the above, periodic cleaning of FO tanks is not warranted.

- **Parameters Monitored/Inspected**
  ASTM D2709 is not utilized at BSEP.

  NUREG-1801, Section XI.M30, recommends the use of ASTM Standards D1796-97 and D2709-96 as the standard test methods for water and sediment in fuel oils. UFSAR Table 1-6, “Conformance to NRC Regulatory Guides,” summarizes: (1) BSEP commitments to Regulatory Guide 1.137, “Fuel Oil Systems for Standby Diesel Generators,” and (2) BSEP commitments to use ASTM D975-88 as the "Standard Specification for Diesel Fuel Oils" and ASTM D4057-88 for oil sampling. BSEP fuel oil testing is based on ASTM D1796-68 (re-approved 1977), “Standard Test Method for Water and Sediment in Fuel Oils by the Centrifuge Method (Laboratory Procedure),” in lieu of ASTM D2709, for determining water and sediment. ASTM D1796-68 is considered a more appropriate test for the fuel oil used at BSEP, because it is the prescribed method by ASTM D975-88.

  Sampling of particulate contaminants, in accordance with ASTM D2276-89, is performed using a filter with a pore size of 0.8 µm versus a pore size of 3.0 µm as specified in NUREG-1801. NUREG-1801, Section XI.M30, recommends that a modified ASTM D2276-00, Method A, be used for determination of particulates. The modification consists of using a filter with a pore size of 3.0 µm, instead of 0.8 µm. ASTM D2276 covers the test method for determination of particulate contaminants in aviation turbine fuel using a field monitor. At BSEP, fuel oil is currently sampled for suspended particulate using ASTM D2276-89 as a laboratory test. Therefore, the BSEP testing provides results equivalent or superior to those obtained using a 3.0 µm pore size as recommended in NUREG-1801.

- **Detection of Aging Effects**
  Tank internal inspection is limited to the Main Fuel Oil Storage Tank.

  NUREG-1801, Section XI.M30, states: “Internal surfaces of tanks that are drained for cleaning are visually inspected to detect potential degradation. However, corrosion may occur at locations in which contaminants may accumulate, such as a tank bottom, and an ultrasonic thickness measurement of the tank bottom surface ensures that significant degradation is not occurring.” At BSEP, internal inspection of the 4-Day, Saddle, and diesel fire pump tanks will not be performed. Access to these small, elevated tanks is limited making cleaning and internal inspections impractical. The tanks are sampled for water and particulates from the low point at least quarterly. External ultrasonic inspection of the bottom of these tanks will be performed. BSEP OE indicates that degradation of these tanks is not occurring. The Fuel Oil Chemistry Program ensures high quality; non-corrosive, non-biologically-contaminated fuel oil is maintained. Fuel analysis results are monitored and trended to detect degradation of tank internals. Corrective action is initiated as necessary to maintain tank integrity.

- **Acceptance Criteria**
  Refer to the discussion of Parameters Monitored/Inspected above. The exceptions evaluated there also are applicable to the Acceptance Criteria element.

- **Corrective Actions**
  The BSEP Fuel Oil Chemistry Program does not use biocides, stabilizers and corrosion inhibitors.

  NUREG-1801, Section XI.M30, states that specific corrective actions are implemented in accordance with the plant quality assurance (QA) program. For example, corrective actions are taken to prevent recurrence when the specified limits for fuel oil standards are exceeded or when water is drained during periodic surveillance. Also, when the presence of biological activity is confirmed, a biocide is added to fuel oil.

  The BSEP Fuel Oil Chemistry Program does not currently use biocides. Tests finding fuel oil to be outside the BSEP limits are directed to operations and the system engineer for evaluation and action. The need for action under the Corrective Action Program for out-of-specification fuel oil is evaluated on an individual case basis. Corrections may be as simple as draining water from the bottom of the tank or addition of new fuel oil to modify the matrix, to complete replacement of the out-of- specification fuel oil.

Enhancements

The following enhancements will be implemented prior to the period of extended operation:

<u>Program Elements Affected</u>

- **Detection of Aging Effects**
  The condition of the in-scope fuel oil tanks will be verified by means of thickness measurements of in-scope tanks and an internal inspection of the Main Fuel Oil Storage Tank. These actions will be performed under the One-Time Inspection Program.

- **Monitoring and Trending**
  Program administrative controls will be enhanced to add a requirement to trend sampling data for water and particulates.

Operating Experience

Most of the OE related to the Fuel Oil Chemistry Program involved improvements to the Program, procedures, and training by means of self-assessments and other individual initiatives.

BSEP has experienced instances of low fuel flash point in new shipments of oil and one occurrence of discoloration of the fuel oil in a Saddle Tank. Low flash point is typically a result of delivery truck contamination with a small amount of gasoline. The apparent cause of the fuel oil discoloration was engine lube oil leaking past a degraded oil seal; however, an analysis confirmed that the critical characteristics for the fuel remained within specification. Also, a leak in a buried fuel oil transfer line was experienced and was attributed to a defect in the external coating of the pipe, leading to localized corrosion and eventual loss of pressure boundary integrity.

A review of plant operating data did not identify any instances of water in the fuel, particulate contamination, or biological fouling. No fuel oil system component failures attributed to fuel oil contamination have been identified.

Conclusion

The Fuel Oil Chemistry Program has been effective at managing aging effects for components wetted by fuel oil. The Program has been improved through evaluation of site and industry OE. The Program provides reasonable assurance that the aging effects will be managed such that the components within the scope of the Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.14 REACTOR VESSEL SURVEILLANCE PROGRAM

Program Description

The Reactor Vessel Surveillance Program is an Integrated Surveillance Program in accordance with 10 CFR 50, Appendix H, Paragraph III.C that is based upon requirements established by the BWR Vessel and Internals Project.

The Reactor Vessel Surveillance Program is described in UFSAR Section 5.3.1.6 and is based upon BWRVIP-78 and BWRVIP-86-A. Referencing of BWR Vessel and Internals Project activities for license renewal was approved by the NRC in its Safety Evaluation regarding BWRVIP-74 of October 18, 2001. The use of BWRVIP-78 and BWRVIP-86 was approved for referencing by the NRC in its Safety Evaluation of February 1, 2000. Use of the BWRVIP Integrated Surveillance Program at BSEP was approved by the NRC in its Safety Evaluation of January 14, 2004.

BWRVIP-116 has been submitted to the NRC for approval to extend the BWRVIP Integrated Surveillance Program through the period of extended operation for the participating BWR plants. BWRVIP-116 identifies and schedules additional capsules to be withdrawn and tested during the license renewal period. BSEP plans to continue using the Integrated Surveillance Program during the period of extended operation by implementing the requirements of BWRVIP-116, and by addressing any additional actions required by the NRC Safety Evaluation for BWRVIP-116 once it is issued.

NUREG-1801 Consistency

The Reactor Vessel Surveillance Program is an existing Integrated Surveillance Program that, following enhancement, will be consistent with NUREG-1801, Section XI.M31.

Exceptions to NUREG-1801

None.

Enhancements

BSEP plans to continue using the Integrated Surveillance Program during the period of extended operation by implementing the requirements of BWRVIP-116, which is under NRC review at this time.

<u>Program Elements Affected</u>

- **Detection of Aging Effects**
  A program enhancement has been identified with respect to obtaining NRC

approval of BWRVIP-116. The BWRVIP and/or BSEP will satisfactorily resolve each issue identified by the NRC and to address any additional actions required by the NRC Safety Evaluation for BWRVIP-116 once it is issued.

Operating Experience

The Reactor Vessel Surveillance Program is described in UFSAR and is an Integrated Surveillance Program based upon BWRVIP-78 and BWRVIP-86-A. The use of BWRVIP-78 and BWRVIP-86-A for referencing was approved by the NRC in its Safety Evaluation of February 1, 2000, and the use of the BWRVIP Integrated Surveillance Program at BSEP was approved by the NRC in its Safety Evaluation of January 14, 2004.

Conclusion

The continued implementation of the Reactor Vessel Surveillance Program provides reasonable assurance that neutron embrittlement aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.15 ONE-TIME INSPECTION PROGRAM

Program Description

The One-Time Inspection Program uses one-time inspections to verify the effectiveness of an aging management program and confirm the absence of an aging effect. The Program includes inspections specified by NUREG-1801, as well as plant-specific inspections where inspection results can reasonably be extrapolated through the period of extended operation. The One-Time Inspection Program is credited for aging management of various structures/components at BSEP as shown below:

Structure/Component	Building Structure/ System	Aging Effect of Concern
Water Chemistry Verification	Reactor Vessel and Internals, Reactor Manual Control, Control Rod Drive Hydraulic, Reactor Water Cleanup, Reactor Coolant Recirculation, Core Spray, Standby Liquid Control, Residual Heat Removal, Containment Atmospheric Control, High Pressure Coolant Injection, Reactor Core Isolation Cooling, Reactor Building Sampling, Post-Accident Sampling, Torus Drain, Feedwater, Heater Drains & Miscellaneous Vents and Drains, Condensate, Makeup Water Treatment, Main Condenser Gas Removal, Radioactive Equipment Drains, Fuel Pool Cooling and Cleanup, and Liquid Waste Processing Systems	Loss of Material, Cracking
Fuel oil tanks in scope for License Renewal	Fuel Oil and Diesel Generator Fuel Oil Systems	Loss of Material due to corrosion
Control Rod Drive Pump Casings, Orifices, and Piping	Control Rod Drive Hydraulic System	Loss of Material due to erosion
Control Rod Drive Hydraulic Control Unit Filters	Control Rod Drive Hydraulic System	Loss of Flow due to fouling
Recirculation Coolant Flow Elements and Main Steam Flow Limiters (Cast Austenitic Stainless Steel)	Reactor Coolant Recirculation and Main Steam Systems (Inspection may not be necessary based outcome of a review of material susceptibility.)	Loss of Fracture Toughness due to thermal aging embrittlement
RHR Throttle Valves	Residual Heat Removal System	Loss of Material due to erosion
Internal surfaces of piping in moist environments	Containment Atmospheric Control and Standby Gas Treatment Systems	Loss of Material due to corrosion
Internal surfaces of relief valve discharge lines	Instrument Air and Heater Drains & Miscellaneous Vents and Drains Systems	Loss of Material due to corrosion

Structure/Component	Building Structure/ System	Aging Effect of Concern
Piping and valves	Auxiliary Boiler and Heat Tracing Systems	Loss of material due to general corrosion, crevice corrosion, and pitting corrosion
Carbon Steel, Copper Alloy, and Elastomeric Components	Screen Wash Water System	Loss of Material due to corrosion and erosion, Cracking
Internal surfaces of Carbon Steel components (not covered by the Preventive Maintenance Program)	Diesel Generator, DG Lube Oil (pneumatic control components), and DG Starting Air Systems	Loss of Material due to corrosion
Intake and Exhaust Silencers	Diesel Generator Intake and Exhaust System	Loss of Material due to corrosion
Internal surfaces of components	Potable Water System	Loss of Material due to corrosion
Tanks, Piping, Valves	HVAC Control Building System	Loss of Material due to corrosion, Cracking
Uncoated component supports and portions of the torus liner	Torus	Loss of Material due to corrosion
Interior surfaces of SRV Discharge Piping (Tailpipes)	Torus	Loss of Material due to corrosion
Components exposed to Raw Water	Non-Contaminated Water Drainage and Radioactive Floor Drains Systems	Cracking and Loss of material due to general corrosion, crevice corrosion, pitting corrosion, and MIC

NUREG-1801 Consistency

The One-Time Inspection Program is a new Program that, after the below-listed enhancements are completed, will be consistent with NUREG-1801, XI.M32, with exception.

Exceptions to NUREG-1801

Program Elements Affected

- **Scope of Program**
  BSEP does not utilize the One-Time Inspection Program activity specified in NUREG-1801, for detection of cracking in small-bore Class 1 piping. Cracking of this piping will be detected and managed by the combination of the ASME Section XI, Subsection IWB, IWC and IWD Program supplemented by the Water Chemistry Program. This is justified by the evaluations performed during implementation of the Risk Informed Inservice Inspection Program at BSEP and by lack of OE indicating that cracking of this piping is occurring. By letter dated April 20, 2001, BSEP requested approval for Risk Informed Inservice Inspection (RI ISI). Approval was received by letter from R. Correia (USNRC) to J. Keenan

(CP&L), dated November 28, 2001: "Brunswick Steam Electric Plant, Unit Nos. 1 and 2 – Safety Evaluation for the Risk Informed Inservice Inspection (RI ISI) Program (TAC Nos. MB1760 and MB1761)" (Accession No. ML013320632). In support of the submittal, evaluations of degradation mechanisms were performed and demonstrated that no locations had a high failure potential on small bore pipe due to Thermal Stratification, Cycling, and Striping (TASCS) and Thermal Transients (TT). The Risk Informed Inservice Inspection Evaluations considered lines greater than 1-inch in diameter. For lines 1-inch and smaller, cracking due to thermal loadings was evaluated and dispositioned as not applicable. Cracking due to mechanical loadings was evaluated by a review of plant-specific OE; no relevant OE was found. The risk associated with cracking due to stress corrosion cracking of these lines is bounded by those components selected for inservice inspection as part of Risk Informed ISI Program. Therefore, the current inspection methods as detailed in the ASME Section XI, Subsection IWB, IWC and IWD Program supplemented by the Water Chemistry Program will manage cracking of small bore piping systems.

- **Detection of Aging Effects**
  BSEP does not utilize the One-Time Inspection Program activity specified in NUREG-1801, for detection of cracking in small-bore Class 1 Piping. Refer to the discussion of this exception under Scope of Program above.

Enhancements

The below-listed enhancement will be implemented prior to the period of extended operation.

<u>Program Elements Affected</u>

- **Scope of Program**
  Procedural controls will be developed to track, implement, complete, and report activities associated with One-Time Inspections.

Operating Experience

The One-Time Inspection Program is a new program. The BSEP aging management review process ensures that one-time inspections have been prescribed and developed with consideration of plant and industry OE.

Conclusion

Implementation of the One-Time Inspection Program provides reasonable assurance that aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent through the period of extended operation.

B.2.16 SELECTIVE LEACHING OF MATERIALS PROGRAM

Program Description

The Selective Leaching of Materials Program ensures the integrity of components (such as piping, pump casings, valve bodies and heat exchanger components) made of cast iron, brasses and aluminum bronze exposed to a raw water, treated water, moisture-laden air or buried environment at BSEP. A procedure will define one-time examination methodology and acceptance criteria. The Program will be implemented by the Work Management Process using a qualitative determination of selected components that may be susceptible to selective leaching. Confirmation of selective leaching may be performed with a metallurgical evaluation or other testing methods.

The examinations will determine whether loss of material due to selective leaching is occurring, and whether the process will affect the ability of the components to perform their intended function(s) for the period of extended operation. A sample population will be selected for the inspections which will be completed prior to commencing the period of extended operation. Evidence suggesting the presence of selective leaching will result in expanded sampling as appropriate and engineering evaluation.

NUREG-1801 Consistency

The Selective Leaching of Materials Program is a new program that is consistent, with one exception, to NUREG-1801, Section XI.M33.

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

- **Scope of Program**
  A qualitative determination of selective leaching will be used in lieu of Brinell hardness testing for components within the scope of this Program. The exception involves the use of examinations, other than Brinell hardness testing identified in NUREG-1801, to identify the presence of selective leaching of material. The exception is justified, because (1) hardness testing may not be feasible for most components due to form and configuration (i.e., heat exchanger tubes) and (2) other mechanical means, i.e., scraping, or chipping, provide an equally valid method of identification.

- **Preventive Actions**
  A qualitative determination of selective leaching will be used in lieu of Brinell hardness testing for components within the scope of this Program. Refer to the discussion of this exception under the Scope of Program element above.

- **Parameters Monitored/Inspected**
  A qualitative determination of selective leaching will be used in lieu of hardness testing for components within the scope of this Program. Refer to the discussion of this exception under the Scope of Program element above.

- **Detection of Aging Effects**
  A qualitative determination of selective leaching will be used in lieu of hardness testing for components within the scope of this Program. Refer to the discussion of this exception under the Scope of Program element above.

- **Monitoring and Trending**
  A qualitative determination of selective leaching will be used in lieu of hardness testing for components within the scope of this Program. Refer to the discussion of this exception under the Scope of Program element above.

Enhancements

None.

Operating Experience

There is OE at BSEP to indicate that selective leaching of materials has occurred. Evidence of selective leaching has resulted in engineering evaluation and/or component replacement. As this is a new Program, there is no OE to confirm Program effectiveness.

Conclusion

This Program includes one-time inspections implemented by a procedure and the Work Management Process performing a qualitative determination of selected components that may be susceptible to selective leaching. A sample population will be selected for the inspections prior to commencing the period of extended operation. The inspections will determine whether loss of material due to selective leaching is occurring, and whether the process will affect the ability of the components to perform their intended function(s) for the period of extended operation. Implementation of the Program provides reasonable assurance that the aging effects will be managed such that the components within the scope of License Renewal will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.17 BURIED PIPING AND TANKS INSPECTION PROGRAM

Program Description

The Buried Piping and Tanks Inspection Program will manage aging effects on the external surfaces of carbon steel, stainless steel and cast iron piping components that are buried in soil or sand. The aging effects/mechanisms of concern are loss of material due to general, pitting and crevice corrosion and MIC. To manage the aging effects, this new Program includes: (a) preventive measures to mitigate degradation (e.g., coatings and wrappings required by design), and (b) visual inspections of external surfaces of buried piping components, when excavated, for evidence of coating damage and degradation. The periodicity of these inspections will be based on plant OE and opportunities for inspection such as scheduled maintenance work requiring excavation. Any evidence of damage to the coating or wrapping, such as perforations, holidays, or other damage, will cause the protected components to be inspected for evidence of loss of material. The results of visual inspections will be reviewed and evaluated to identify susceptible locations that may warrant further inspections. The Program assures that the effects of aging on buried piping components are being effectively managed for the period of extended operation. The Program will be implemented prior to the period of extended operation and will include procedural requirements to (1) ensure an appropriate as-found pipe coating and material condition inspection is performed whenever buried piping within the scope of this Program is exposed, (2) add precautions concerning excavation and use of backfill to the excavation procedure to include precautions for License Renewal piping, (3) add a requirement that coating inspection shall be performed by qualified personnel to assess its condition, and (4) add a requirement that a coating engineer or other qualified individual should assist in evaluation of any coating degradation noted during the inspection.

NUREG-1801 Consistency

The Buried Piping and Tanks Inspection Program is a new program that is consistent, with exceptions, to NUREG-1801, Section XI.M34.

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

- **Scope of Program**
  In addition to carbon steel piping components, buried stainless steel and cast iron piping components are considered an acceptable exception to the limited material scope delineated by the NUREG-1801 program. The aging effects are managed by use of external coatings and inspections regardless of the piping material. This Program includes no buried tanks.

- **Detection of Aging Effects**
  NUREG-1801 refers to periodic inspections with a scheduled frequency. BSEP, however, intends to inspect buried piping only when excavated during maintenance activities. Excavating components solely to perform inspections poses undue risk of damage to protective coatings. OE indicates that the frequency of excavating buried piping for maintenance activities is sufficient to provide reasonable assurance that the effects of aging will be identified prior to loss of intended function.

Enhancements

None.

Operating Experience

Industry OE has shown that carbon steel and cast iron buried components have experienced corrosion degradation. Critical areas include those at the interface where the component transitions from above ground to below ground. This is an area where coatings are often missing or damaged.

Leaks have occurred in BSEP buried piping components and have been repaired, which demonstrates that leaks have been detected and that appropriate corrective actions have been taken to ensure no loss of component intended function in the period of extended operation. BSEP conducts pressure tests of safety-related Service Water System buried piping to ensure adequate flow delivery and Technical Specification operability.

Based on plant OE, scheduled, periodic excavations of buried piping for inspection are not warranted. As additional OE is obtained, lessons learned may be used to adjust this Program.

Conclusion

Implementation of the Buried Piping and Tanks Inspection Program provides reasonable assurance that the aging effect of loss of material due to corrosion mechanisms will be managed such that systems and components within the scope of License Renewal will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.18 ASME SECTION XI, SUBSECTION IWE PROGRAM

Program Description

The ASME Section XI, Subsection IWE Program consists of periodic inspections of steel containment structures. The Program is in accordance with the ASME Code, Section XI, Subsection IWE, 1992 Edition, with the 1992 Addenda, as modified by 10CFR50.55a. The IWE Program is credited for the aging management of:

- Steel liners for the concrete containment and their associated integral attachments,
- Containment personnel and equipment airlocks, hatches, and drywell head,
- Seals, gaskets, and moisture barriers,
- Torus liner, downcomers, and vent header, and
- Pressure retaining bolting.

The primary inspection method for the steel containment liner and its integral attachments is visual examination. Limited volumetric examinations utilizing ultrasonic thickness measurements are implemented as applicable.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWE Program is an existing program that is consistent with NUREG-1801, Section XI.S1. As noted in the description of the NUREG-1801 Section XI.S1 program, 10 CFR 50.55a governs the application of Codes and Standards. Therefore, differences between the BSEP Code of record and the Code edition specified in NUREG-1801 are not considered to be an exception to NUREG-1801. In addition, exceptions to ASME Code requirements that have been granted by approved relief requests are not considered to be exceptions to NUREG-1801 criteria.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The ASME Section XI, Subsection IWE Program is implemented and maintained in accordance with the general requirements for engineering programs. This provides assurance that the programs:

- Are effectively implemented to meet regulatory, process, and procedure requirements, including periodic reviews,
- Have qualified personnel assigned as program managers, with authority and responsibility to implement the Program,
- Have adequate resources committed to Program activities, and
- Are managed in accordance with plant administrative controls.

The review of plant-specific OE has identified numerous assessments, performed on both a plant-specific and corporate basis, dealing with Program development, effectiveness, and implementation. The BSEP IWE Program is continually being upgraded based upon industry and plant-specific experience. Additionally, plant OE is shared between Progress Energy sites through regular peer group meetings, a common corporate sponsor, and outage participation of program managers from other Progress Energy sites.

Conclusion

The ASME Section XI, Subsection IWE Program provides reasonable assurance that the aging effects of the steel containment liner, integral attachments, airlocks, hatches, drywell head, torus liner, downcomers, vent header, seals, gaskets, moisture barriers, and pressure retaining bolting are adequately managed such that their intended functions are maintained during the period of extended operation.

B.2.19 ASME SECTION XI, SUBSECTION IWL PROGRAM

Program Description

The ASME Section XI, Subsection IWL Program consists of periodic visual inspection of reinforced concrete containment structures. The Program is in accordance with ASME Code, Section XI, Subsection IWL, 1992 Edition, 1992 Addenda, and is credited for the aging management of accessible and inaccessible, pressure retaining, primary containment concrete. The BSEP concrete containments do not utilize a post-tensioning system; therefore, the IWL requirements associated with a post-tensioning system are not applicable.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWL Program is an existing Program that is consistent, with one exception, to NUREG-1801, Section XI.S2. As noted in the description of the NUREG-1801 Section XI.S2 program, 10 CFR 50.55a governs the application of Codes and Standards. Therefore, differences between the BSEP Code of record and the Code edition specified in NUREG-1801 are not considered to be an exception to NUREG-1801. In addition, exceptions to ASME Code requirements that have been granted by approved relief requests are not considered to be exceptions to NUREG-1801 criteria.

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

- **Scope of Program**
  The BSEP concrete containments do not utilize a post-tensioning system; therefore, the IWL requirements associated with a post-tensioning system are not applicable and are excluded from the Program.

Enhancements

None.

Operating Experience

The ASME Section XI, Subsection IWL Program is implemented and maintained in accordance with the general requirements for engineering programs. This provides assurance that the programs:

- Are effectively implemented to meet regulatory, process, and procedure requirements, including periodic reviews,

- Have qualified personnel assigned as program managers, with authority and responsibility to implement the Program,
- Have adequate resources committed to Program activities, and
- Are managed in accordance with plant administrative controls.

Plant-specific OE has identified numerous assessments, performed on both a plant-specific and corporate basis, dealing with Program development, effectiveness, and implementation. The BSEP ASME Section XI, Subsection IWL Program is continually being upgraded based upon industry and plant-specific experience. Additionally, plant OE is shared between Progress Energy sites through regular peer group meetings, a common corporate sponsor, and outage participation of program managers from other Progress Energy sites.

Conclusion

The ASME Section XI, Subsection IWL Program provides reasonable assurance that the aging effects of pressure retaining Primary Containment concrete are adequately managed so that the intended functions of the concrete will be maintained during the period of extended operation.

B.2.20 ASME SECTION XI, SUBSECTION IWF PROGRAM

Program Description

The ASME Section XI, Subsection IWF Program provides for visual examination of component and piping supports within the scope of license renewal for loss of material and loss of mechanical function. The Program is implemented through plant procedures, which provide for visual examination of inservice inspection Class 1, 2, 3, and MC supports in accordance with the requirements of ASME Section XI, Subsection IWF, 1989 Edition, and ASME Code Case N-491.

NUREG-1801 Consistency

The BSEP ASME Section XI, Subsection IWF Program is an existing Program that, following enhancement, will be consistent with the program described in NUREG-1801, Section XI.S3. As noted in the description of the NUREG-1801 Section XI.S3 program, 10 CFR 50.55a governs the application of Codes and Standards. Therefore, differences between the BSEP Code of record and the Code edition specified in NUREG-1801 are not considered to be an exception to NUREG-1801. In addition, exceptions to ASME Code requirements that have been granted by approved relief requests are not considered to be exceptions to the NUREG-1801 criteria.

Exceptions to NUREG-1801

None.

Enhancements

The below-listed enhancement affecting the following program element will be implemented prior to the period of extended operation.

Program Element Affected

- **Scope of Program**
  The torus vent system supports are to be included within the scope of the ASME Section XI, Subsection IWF Program.

Operating Experience

The ASME Section XI, Subsection IWF Program is implemented and maintained in accordance with the general requirements for engineering programs. This provides assurance that the programs:

- Are effectively implemented to meet regulatory, process, and procedure requirements, including periodic reviews,

- Have qualified personnel assigned as program managers, with authority and responsibility to implement the Program,
- Have adequate resources committed to Program activities, and
- Are managed in accordance with plant administrative controls.

Plant-specific OE has identified numerous assessments, performed on both a plant-specific and corporate basis, dealing with Program development, effectiveness, and implementation. The BSEP ASME Section XI, Subsection IWF Program is continually being upgraded based upon industry and plant-specific experience. Additionally, plant OE is shared between Progress Energy sites through regular peer group meetings, a common corporate sponsor, and outage participation of program managers from other Progress Energy sites.

Conclusion

The ASME Section XI, Subsection IWF Program provides reasonable assurance that the aging effects of the Class 1, 2, 3, and MC component supports are adequately managed such that their intended functions are maintained consistent with the CLB throughout the period of extended operation.

B.2.21 10 CFR PART 50, APPENDIX J PROGRAM

Program Description

The 10 CFR Part 50, Appendix J Program is structured in accordance with the requirements of 10 CFR 50, Appendix J, and assures the required performance-based leak testing of the containment and its penetrations. The Program is the acceptable method for verifying, through testing, the management of aging effects for containment integrity as documented in NUREG-1801, Chapter II. The 10 CFR Part 50, Appendix J Program is applicable to the leakage testing portion of aging management for the BSEP containment and its penetrations. The Program is in accordance with Option B (performance based leak testing) of 10 CFR 50, Appendix J and the guidelines contained in Regulatory Guide 1.163, September 1995, and NEI 94-01, "Industry Guideline for Implementing Performance Based Option of 10 CFR Part 50, Appendix J."

NUREG-1801 Consistency

The 10 CFR Part 50, Appendix J Program is an existing program and is consistent with NUREG-1801, Section XI.S4. Exceptions approved through License Amendment are considered consistent with GALL because they have been reviewed and approved by the NRC staff.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The 10 CFR Part 50, Appendix J Program is maintained in accordance with BSEP engineering program requirements. This provides assurance that the Program is effectively implemented to meet regulatory, process, and procedure requirements, including periodic reviews; qualified personnel are assigned as program managers, and are given authority and responsibility to implement the Program; and adequate resources are committed to Program activities. Based on review of operating history, corrective actions, and self-assessments, the 10 CFR Part 50, Appendix J Program is continually monitored and enhanced to incorporate the results of OE; as such it provides an effective means of ensuring the structural integrity and leak tightness of the BSEP containment.

Conclusion

Continued implementation of the 10 CFR Part 50, Appendix J Program provides reasonable assurance that the aging effects will be managed such that the components/ commodities within the scope of this Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.22 MASONRY WALL PROGRAM

Program Description

The BSEP Masonry Wall Program is based on guidance provided in NRC IE Bulletin 80-11, "Masonry Wall Design," and is implemented through corporate procedure. The Program provides for inspections of masonry walls within the scope of License Renewal for cracking. Masonry walls within the Service Water Building, Reactor Building, Augmented Off-Gas Building, Diesel Generator Building, Control Building, and Turbine Building are within the scope of the Masonry Wall Program. This group includes the masonry walls identified as in proximity to or having attachments to safety related components in response to Bulletin 80-11. The Program is a condition monitoring program with the inspection frequencies established such that no loss of intended function would occur between inspections.

NUREG-1801 Consistency

The Masonry Wall Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.S5.

Exceptions to NUREG-1801

None.

Enhancements

The below-listed enhancement affecting the following program element will be implemented prior to the period of extended operation.

<u>Program Element Affected</u>

- **Parameters Monitored/Inspected**
  The inspection attribute "Cracking" in the Program procedure will be revised to remove the restriction on inspecting the walls "within 1 ft of wall penetrations or of floor, ceiling, or lateral support connections" when assuring the absence of cracks.

Operating Experience

The Masonry Wall Program has provided for the detection of cracks and other minor aging effects in masonry walls. The corrective action process has ensured the Program is implemented consistent with the BSEP design basis. A Licensee Event Report (LER 1-92-012, "Emergency Diesel Generator Building Internal Wall Seismic Support Bolting was Defectively Installed during Plant Construction") required a reevaluation of the original response to Bulletin 80-11. The reevaluation was implemented in strict compliance with Bulletin 80-11 and resulted in a scope expansion from 86 safety related masonry walls in the original response to 153 safety related walls.

Structural monitoring programs are continually being upgraded based upon industry and Progress Energy plant experience. Operating history has shown the Masonry Wall Program to be an effective management tool based on the frequency and acceptable results of past inspections.

Conclusion

Continued implementation of the Masonry Wall Program provides reasonable assurance that the aging effect of cracking is adequately managed so that the intended functions of masonry walls within the scope of License Renewal are maintained during the period of extended operation.

B.2.23 STRUCTURES MONITORING PROGRAM

Program Description

The Structures Monitoring Program manages the aging effects of civil commodities within the scope of License Renewal. The Structures Monitoring Program is implemented, through procedures, in accordance with the regulatory requirements and guidance associated with the Maintenance Rule, 10 CFR50.65; NRC Regulatory Guide 1.160, “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” Rev. 2, and NEI (NUMARC) 93-01, “Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” Rev. 2. The Program incorporates criteria recommended by the INPO Good Practice document 85-033, “Use of System Engineers;” NEI 96-03, “Guidelines for Monitoring the Condition of Structures at Nuclear Plants,” and inspection guidance based on industry experience and recommendations from ACI 349.3R-96, “Evaluation of Existing Nuclear Safety-Related Concrete Structures;” and ASCE 11-90, “Guideline for Structural Condition Assessment of Existing Buildings.” The Program consists of periodic inspection and monitoring of the condition of structures and structure component supports to ensure that aging degradation leading to loss of intended functions will be detected and that the extent of degradation can be determined.

NUREG-1801 Consistency

The BSEP Structures Monitoring Program is an existing program that, following enhancement, will be consistent with the NUREG-1801, Section XI.S6.

Exceptions to NUREG-1801

None.

Enhancements

The below-listed enhancements affecting the following program elements will be implemented prior to the period of extended operation.

<u>Program Elements Affected</u>

- **Scope of Program**
  Administrative controls that implement the Program will be revised to:
  (1) Specifically identify the complete list of systems and structures that credit the Program for aging management,
  (2) Specifically define the inspection boundaries between the system and associated structure, and

(3) Notify the responsible engineer when below-grade concrete is exposed.

- **Parameters Monitored/Inspected**
  Administrative controls that implement the Program will be revised to:
  (1) Identify the following commodities within a condition monitoring group:
    - Battery Racks
    - Damper Mounting
    - Doors
    - Electrical Enclosures
    - Fire Hose Stations
    - Instrument Supports
    - Instrument Racks

  (2) Include the following inspection attributes:
    - Wear (associated with doors)
    - Sedimentation (associated with the intake canal)

  (3) Require the responsible engineer to review the groundwater monitoring results against applicable parameters for determination of an aggressive below grade environment.
  (4) Require inspection of below grade concrete when exposed by excavation.
  (5) Specify that an increase in sample size for component supports shall be implemented (rather than should be) commensurate with the degradation mechanisms found.
  (6) Require an inspection of below grade concrete, by the responsible engineer, prior to backfill.

- **Detection of Aging Effects**
  Revise System Engineer training materials to include the procedure regarding condition monitoring of structures as a procedure requiring In-depth knowledge.

Operating Experience

The Structures Monitoring Program incorporates best practices recommended by the Institute of Nuclear Power Operations (INPO) and inspection guidance based on industry experience and recommendations from ACI and ASCE.

A review of inspection reports, self-assessments, and condition reports has concluded the administrative controls are effective in identifying age related degradation, implementing appropriate corrective actions, and continually upgrading the administrative controls used for structures monitoring.

The area surrounding the Service Water Intake Structure, adjacent to the Intake Canal, is subject to an aggressive environment due to high levels of chlorides and sulfates in the intake water. The Service Water Intake Structure is monitored on an increased frequency (every two years), due to the environment and history of degradation. The below-grade concrete and concrete below the intake canal water level are monitored from the building interior on a two-year frequency. Exterior concrete exposed to water is monitored on an annual frequency below the waterline. Groundwater is monitored from various manholes and wells around the site, as well as the intake canal, for pH and the concentration of chlorides and sulfates. This information is provided to the responsible engineer and used to confirm the absence of an aggressive environment in the below-grade areas away from the intake canal.

Conclusion

Implementation of the Structures Monitoring Program ensures the effects of aging associated with License Renewal civil commodities will be adequately managed so that there is reasonable assurance that their intended functions will be performed consistent with the CLB during the period of extended operation.

B.2.24 PROTECTIVE COATING MONITORING AND MAINTENANCE PROGRAM

Program Description

The Protective Coating Monitoring and Maintenance Program is a condition monitoring program for Service Level I coatings applied inside the primary containment (Drywell and Torus) of Units 1 and 2. Coating parameters monitored include blistering, cracking, flaking, rusting, and other distress (indicated by peeling, undercutting, discoloration or physical damage). The Program prevents clogging of ECCS suction strainers and containment spray nozzles by assuring that the quantity of damaged or degraded coatings inside primary containment, that could detach during a loss-of-coolant accident, remains within analyzed limits. The limits are based upon head loss calculations for ECCS suction strainers installed in the mid-1990s that quantify the amount of debris of various types, including insulation, corrosion products, and coating debris that can be tolerated without impairing system function. Specific limits apply for coating debris.

The Program also performs in-process inspections for coating repairs and refurbishments to assure coatings are qualified. Unqualified coatings and damaged or degraded coatings are quantified and tracked on a Coatings Exempt Log, and the cumulative total is compared to qualified limits.

NUREG-1801 Consistency

The Protective Coating Monitoring and Maintenance Program is an existing program that, following enhancement, will be consistent, with an exception, to NUREG-1801, Section XI.S8.

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

- **Preventive Actions**
  The Protective Coating Monitoring Program is not credited within the License Renewal review for prevention of corrosion of carbon steel.

- **Operating Experience**
  The Protective Coating Monitoring Program is not credited within the License Renewal review for prevention of corrosion of carbon steel.

Enhancements

The below-listed enhancements will be implemented prior to the period of extended operation.

Program Elements Affected

- **Detection of Aging Effects**
  Program administrative controls will be enhanced to: (1) add a requirement for a walk-through, general inspection of containment areas during each refueling outage, including all accessible pressure-boundary coatings not inspected under the ASME Section XI, Subsection IWE Program, (2) add a requirement for a detailed, focused inspection of areas noted as deficient during the general inspection, and (3) assure that the qualification requirements for persons evaluating coatings are consistent among the Service Level I coating specifications, inspection procedures, and application procedures, and meet the requirements of ANSI N101.4, “Quality Assurance for Protective Coatings Applied to Nuclear Facilities.”

- **Acceptance Criteria**
  Program administrative controls will be enhanced to document the results of inspections and compare the results to previous inspection results and to acceptance criteria. These activities are performed, but are not adequately incorporated into Program procedures.

Operating Experience

The BSEP response to NRC GL 98-04 described how the Protective Coating Monitoring Program complies with Regulatory Guide 1.54, Revision 0, which endorses ANSI N101.4-1972. The response described Program attributes, including design and licensing basis, procurement, control of coating application, quality assurance, monitoring, and maintenance of Service Level 1 coatings. It also explained that the protective coatings below the waterline in the Torus of each Unit were removed and replaced from 1994 to 1996. The replacement coatings were applied using materials, application methods, and quality assurance practices conforming to the requirements of ANSI N101.4-1972, “Quality Assurance for Protective Coatings Applied to Nuclear Facilities,” ANSI N101.2-1972, “Protective Coatings (Paints) for Light Water Nuclear Reactor Containment Facilities,” and ANSI N512-1974, “Protective Coatings (Paints) for the Nuclear Industry.”

Service Level I protective coatings were determined to be within the scope of 10 CFR 50.65, the Maintenance Rule and a maintenance rule monitoring system was created to manage ECCS suction strainer debris. Protective coatings are managed as a discrete subset of this maintenance rule debris management system. During refueling outages, inspections are performed to identify qualified coatings that were damaged or degraded during the previous operating cycle.

Conclusion

Continued implementation of Protective Coating Monitoring Program will provide reasonable assurance that the aging effects will be managed such that Service Level I coatings will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.25 ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS PROGRAM

Program Description

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is credited for aging management of cables and connections not included in the BSEP EQ Program. Accessible electrical cables and connections installed in adverse localized environments are visually inspected at least once every 10 years for cable and connection jacket surface anomalies, such as embrittlement, discoloration, cracking, swelling, or surface contamination, which are precursor indications of conductor insulation aging degradation from heat, radiation or moisture. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service condition for the electrical cable or connection.

The aging effects/mechanisms of concern are as follows:

- Reduced Insulation Resistance
- Electrical Failure

The technical basis for selecting the sample of cables and connections to be inspected is defined in the implementing BSEP program document. The sample locations will consider the location of cables and connections inside and outside Primary Containment as well as any known adverse localized environments.

NUREG-1801 Consistency

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program consistent with NUREG-1801, Section XI.E1.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program with no OE history. However, as noted in NUREG-1801, industry OE has shown that adverse localized environments caused by heat or radiation for electrical cables and connections have been shown to exist and have been found to produce degradation of insulating materials that is visually observable.

Conclusion

Implementation of the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will provide reasonable assurance that the aging effects will be managed such that the insulated cables and connectors not included in the BSEP EQ Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.26 ELECTRICAL CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS USED IN INSTRUMENTATION CIRCUITS PROGRAM

Program Description

The Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is credited for the aging management of radiation monitoring and neutron flux monitoring instrumentation cables not included in the BSEP EQ Program. Exposure of electrical cables to adverse localized environments caused by heat or radiation can result in reduced insulation resistance (IR). A reduction in IR is a concern for circuits with sensitive, low-level signals such as radiation monitoring and nuclear instrumentation circuits since it may contribute to signal inaccuracies. For radiation monitoring instrumentation circuits, the results of routine calibration tests will be used to identify the potential existence of cable aging degradation. For neutron flux instrumentation circuits, field cables will be tested at least once every 10 years. Testing may include IR tests, time domain reflectometry (TDR) tests, current versus voltage (I/V) testing, or other testing judged to be effective in determining cable insulation condition.

The aging effects/mechanisms of concern are as follows:

- Reduced IR
- Electrical Failure

The scope of this Program applies to non-EQ cables used in process radiation monitoring instrumentation circuits, area radiation monitoring instrumentation circuits, and neutron flux monitoring instrumentation circuits that are sensitive to a reduction in IR. NUREG-1801, Section XI.E1 does not apply to the cables utilized in these instrumentation circuits.

NUREG-1801 Consistency

The Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a new program that is consistent with NUREG-1801, Section XI.E2, with exceptions.

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

- **Parameters Monitored/Inspected**
  Direct cable testing will be performed as an alternative to instrument loop calibrations for neutron flux monitoring instrumentation circuits. The parameters

monitored include a loss of dielectric strength caused by thermal/thermoxidative degradation of organics or radiation-induced oxidation (radiolysis) of organics.

- **Detection of Aging Effects**
  Direct cable testing will be performed as an alternative to instrument loop calibrations for neutron flux monitoring instrumentation circuits.

- **Acceptance Criteria**
  Direct cable testing will be performed as an alternative to instrument loop calibrations for neutron flux monitoring instrumentation circuits. The acceptance criteria will be determined based on the type of test selected for these cables.

- **Corrective Actions**
  Direct cable testing will be performed as an alternative to instrument loop calibrations for neutron flux monitoring instrumentation circuits. Corrective actions such as additional testing and trouble-shooting are implemented when test results do not meet the acceptance criteria.

Enhancements

None.

Operating Experience

The Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a new program with no OE history. However, as noted in NUREG-1801, industry OE has shown that exposure of electrical cables to adverse localized environments caused by heat or radiation can result in reduced IR. Reduced IR causes an increase in leakage currents between conductors and from individual conductors to ground. A reduction in IR is a concern for circuits with sensitive, low-level signals such as radiation monitoring and nuclear instrumentation circuits, since it may contribute to signal inaccuracies.

Conclusion

Implementation of the Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program will provide reasonable assurance that the intended functions of non-EQ electrical cables used in instrumentation circuits with sensitive high voltage, low-level signals exposed to adverse localized environments caused by heat, radiation, or moisture will be maintained consistent with the CLB through the period of extended operation.

B.2.27 INACCESSIBLE MEDIUM-VOLTAGE CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS PROGRAM

Program Description

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is credited for aging management of cables not included in the BSEP EQ Program. In-scope, medium-voltage cables exposed to significant moisture and significant voltage are tested at least once every 10 years to provide an indication of the condition of the conductor insulation. The specific type of test performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, or polarization index, or other testing that is state-of-the-art at the time the test is performed. Significant moisture is defined as periodic exposures that last more than a few days (e.g., cable in standing water). Periodic exposures that last less than a few days (e.g., normal rain and drain) are not significant. Significant voltage exposure is defined as being subjected to system voltage for more than 25% of the time. Continuous wetting and continuous energization are not significant for medium-voltage cables that are designed for these conditions (e.g., submarine cables).

NUREG-1801 Consistency

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program and is consistent with NUREG-1801, Section XI.E3.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program with no OE history. However, as noted in NUREG-1801, industry OE has shown that XLPE or high molecular weight polyethylene (HMWPE) insulation materials are most susceptible to water tree formation. The formation and growth of water trees varies directly with operating voltage. Treeing is much less prevalent in 4KV cables than those operated at 13KV or 33KV. Also, minimizing exposure to moisture minimizes the potential for the development of water treeing.

Conclusion

Implementation of the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will provide reasonable assurance that the intended functions of inaccessible non-EQ medium-voltage cables exposed to adverse localized equipment environments caused by moisture while energized will be maintained consistent with the CLB through the period of extended operation.

B.2.28 REACTOR VESSEL AND INTERNALS STRUCTURAL INTEGRITY PROGRAM

Program Description

The Reactor Vessel and Internals Structural Integrity Program is an existing plant-specific program that includes:

- Inspection in accordance with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program and inspection and flaw evaluation in conformance with the guidelines of the BWR Owner's Group, Boiling Water Reactor Vessel and Internals Project (BWRVIP) documents.
- Monitoring and control of reactor coolant water chemistry, through the use of the BSEP Water Chemistry Program, in accordance with the latest guidelines of BWRVIP, helps ensure the long-term integrity and safe operation of the Reactor Vessel and Internals components.

This Program is based on the requirements set forth in BWRVIP-94, BWR Vessel and Internals Project, "Program Implementation Guide." As stated in BWRVIP-94, the guidelines listed in the reference section should be implemented to the fullest extent possible. This includes BWRVIP-74, which has been approved by the NRC staff for referencing in License Renewal Applications.

The Reactor Vessel and Internals Structural Integrity Program is a highly specialized program that uses combinations of BWRVIP documents and considers the related NRC Safety Evaluation Reports and their associated Applicant Action Items. The responses to applicable Applicant Action Items are discussed below.

Aging Management Program Elements

The results of an evaluation of each element against the 10 elements described in Appendix A of the SRP-LR, NUREG-1800, are provided below.

- **Scope of Program**
  This Program uses the BWRVIP program, BWRVIP-74-A, as the basis for managing the effects of cracking, loss of material, flow blockage, loss of pre-load, and reduction of fracture toughness of the reactor vessel and internals components. This Program is based on the requirements set forth in BWRVIP-94. As stated in BWRVIP-94, the guidelines listed in the reference section should be implemented to the fullest extent possible. In general, the Program addresses guidance for inspection, assessment, mitigation, and repair and/or replacement of reactor vessel internal components, as needed, to maintain the ability of the reactor vessel and internals components to perform their intended functions.

- **Preventive Actions**
  Maintaining high water purity reduces susceptibility to cracking due to SCC or IGSCC. Reactor coolant water chemistry is monitored and maintained in accordance with the latest BWRVIP guidelines. The program description and evaluation, and technical basis of monitoring and maintaining reactor water chemistry are presented in the discussion of the BSEP Water Chemistry Program.

- **Parameters Monitored/Inspected**
  The BWRVIP guidelines documents reviewed the function of each of the reactor vessel and internals components. The BWRVIP guidelines considered the mechanisms that may cause degradation of reactor vessel and internals components and developed an inspection program that would enable degradation to be detected and evaluated before the intended functions of the components are adversely affected. Details regarding inspection and evaluation are contained within the reactor vessel and internals component-specific BWRVIP inspection and evaluation guidelines document.

- **Detection of Aging Effects**
  Reactor vessel and internals components are inspected using a combination of ultrasonic, visual, and surface examinations as appropriate. The methods and the frequencies of examination will be consistent with the applicable BWRVIP inspection and evaluation documents, and the BWROG "Alternate BWR Feedwater Nozzle Inspection Requirements."

  BSEP will perform augmented inspections of the top guide similar to the inspections of CRD Housing guide tubes, using an enhanced visual examination. These inspections may be modified should BWRVIP-26, "BWR Vessels and Internals Project, BWR Top Guide Inspection and Flaw Evaluation Guidelines," be revised in the future.

- **Monitoring and Trending**
  The Program provides for monitoring for the presence of aging degradation per the guidance provided in the ASME Section XI schedules, the BWRVIP inspection and evaluation documents, and BWROG "Alternate BWR Feedwater Nozzle Inspection Requirements." The frequency of examination, as specified within these documents, varies for each component. The frequency is based on the component's design, flaw tolerance, susceptibility to degradation, and the method of examination used. Documentation is maintained that facilitates trending through comparison with previous and subsequent inspection results.

- **Acceptance Criteria**
  BWRVIP inspection and evaluation documents provide the basis for reactor vessel and internals inspection requirements, acceptance criteria, and corrective

actions. Relevant indications are evaluated in accordance with American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI 1989 Edition or the applicable BWRVIP evaluation guideline.

- **Corrective Actions**
  Programmatic issues are identified, tracked, resolved, and trended using the BSEP Corrective Action Program. Identified deviations are evaluated within the BSEP corrective action process, which includes provisions for root cause determinations and corrective actions to prevent recurrence.

- **Confirmation Process**
  Corporate Quality Assurance Procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of Appendix B to 10 CFR 50.

- **Administrative Controls**
  See Confirmation Process above.

- **Operating Experience**
  The OE of BSEP mirrors that of the BWR fleet. The program guidelines outlined in applicable BWRVIP documents are based on evaluation of available OE information, including BWR inspection results and information on the elements that cause degradation. This information is used to determine which components may be susceptible to cracking and loss of material and to enhance inspection strategies, as applicable. Implementation of the Program provides reasonable assurance that the aging effects will be adequately managed so the intended functions of the reactor vessel and internals components will be maintained consistent with the CLB for the period of extended operation.

Enhancements

Prior to the period of extended operation, the below-listed enhancements will be implemented in the following program elements:

<u>Program Elements Affected</u>

- **Detection of Aging Effects**
  Applicant Action Item 4 to BWRVIP-26 requires applicants to address the susceptibility to IASCC of the Top Guide. BSEP will perform augmented inspections for the Top Guide similar to the inspections of Control Rod Drive Housing (CRDH) guide tubes. The sample size and frequency for CRDH guide tubes is a 10% sample of the total population within 12 years; one half (5%) to be completed within six years. The method of examination is an enhanced visual examination (EVT-1). The Top Guide inspections will focus on the high fluence region. These augmented inspections may be modified should BWRVIP 26,

"BWR Vessels and Internals Project, BWR Top Guide Inspection and Flaw Evaluation Guidelines (BWRVIP-26)," be revised in the future.

The examination of the Core Shroud Repair Brackets should consist of a VT-3 inspection of the locking devices, contact areas, bolting, and the overall condition of the component. Bolt tightness should be verified by visually examining the repair assembly and verifying that the threaded components are seated and that there are no unintended gaps at the tensioned member contact points.

Response to Applicant Action Items

The following tables address License Renewal Applicant Action Items resulting from NRC reviews of BWRVIP documents associated with this aging management program.

Table 1	BWRVIP-74-A	Table 6	BWRVIP-38
Table 2	BWRVIP-18	Table 7	BWRVIP-41
Table 3	BWRVIP-25	Table 8	BWRVIP-47
Table 4	BWRVIP-26	Table 9	BWRVIP-48
Table 5	BWRVIP-27	Table 10	BWRVIP-49

BWRVIP-03 and BWRVIP-76 have not been reviewed and approved by the NRC for License Renewal at this time. BWRVIP-42, "LPCI Coupling Inspection and Flaw Evaluation Guidelines," is not applicable to BSEP. BSEP is a BWR-4 whose low pressure coolant injection function of the Residual Heat Removal System injects into the Reactor Coolant Recirculation system discharge lines rather than injecting directly into the reactor vessel.

The first three Applicant Action Items (AAIs) in most of the Safety Evaluation Reports are common. However, for completeness, each of the tables has the full text of the Applicant Action Item. Table 1 will provide the generic response to the first three AAIs.

TABLE 1 - BWRVIP-74-A BWR REACTOR PRESSURE VESSEL INSPECTION AND FLAW EVALUATION GUIDELINES FOR LICENSE RENEWAL		
AAI #	APPLICANT ACTION ITEM	RESPONSE
1	The LR applicant is to verify that the BWRVIP-74 report is applicable to its plant. Further, the LR applicant is to commit to programs described as necessary in the BWRVIP-74 report to manage the effects of aging on the functionality of the RPV components during the period of extended operation. LR applicants will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMP within the BWRVIP-74 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the LR applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	BSEP participates in the BWRVIP. As such, the BWRVIP is applicable to BSEP. For current and future open issues between the BWRVIP and NRC, BSEP will work as part of the BWRVIP to resolve these issues generically. If, upon review of a BWRVIP approved guideline, it is determined that known exceptions to full compliance are warranted, the NRC shall be notified of the exception within 45 days of the receipt of NRC final approval of the guideline. The programs described in BWRVIP-74-A as necessary to manage the effects of aging on the functionality of the RPV components during the period of extended operation are summarized in BWRVIP-74-A, Table 4-1. The Reactor Vessel and Internals Structural Integrity Program description will be included in Appendix A of the LRA, the UFSAR Supplement. BSEP's commitment to this program will be submitted to the NRC based on the program description.
2	10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those LR applicants referencing the BWRVIP-74 report for the RPV components shall ensure that the programs and activities specified as necessary in the BWRVIP-74 report are summarily described in the FSAR supplement.	The UFSAR Supplement will include a summary description of the programs and activities specified as necessary in the BWRVIP report.
3	10 CFR 54.22 requires that each LR application include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the LR application. In its Appendix A to the BWRVIP-74 report, the BWRVIP stated that technical specification changes resulting from neutron embrittlement will be made at the appropriate time prior to the end of the current license. Those LR applicants referencing the BWRVIP-74 report for the RPV components shall ensure that the inspection strategy described in the BWRVIP-74 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its LR application.	No technical specification changes are required.
4	The staff is concerned that leakage around the reactor vessel seal rings could accumulate in the VFLD lines, cause an increase in the concentration of contaminants and cause cracking in the VFLD line. The BWRVIP-74 report does not identify this component as within the scope of the report. However, since the VFLD line is attached to the RPV and provides a pressure boundary function, LR applicants should identify an AMP for the VFLD line.	The vessel flange leak detection lines are not part of the reactor coolant pressure boundary and as such are not evaluated against Chapter IV of NUREG-1801. These lines (associated with Nozzle N13) are within the scope of License Renewal and are evaluated with all other non-reactor coolant pressure boundary piping and fittings. The AMR for these lines concluded that these lines are susceptible to cracking and loss of material. These lines will be managed by the Water Chemistry and One-Time Inspections Programs.
5	LR applicants shall describe how each plant-specific aging management program addresses the following elements: (1) scope of the program, (2) preventive actions, (3) parameters monitored or inspected, (4) detection of aging effects, (5) monitoring and trending, (6) acceptance criteria, (7) corrective actions, (8) confirmation process, (9) administrative controls, and (10) operating experience.	The description of Aging Management Programs credited for license renewal at BSEP is provided in this Appendix. Refer to the discussion of Aging Management Program Elements (or NUREG-1801 Consistency) discussion for each program. The presentation of AMP elements is consistent with the guidance provided in ISG 10.

TABLE 1 (CONTINUED) - BWRVIP-74-A BWR REACTOR PRESSURE VESSEL INSPECTION AND FLAW EVALUATION GUIDELINES FOR LICENSE RENEWAL		
AAI #	APPLICANT ACTION ITEM	RESPONSE
6	The staff believes inspection by itself is not sufficient to manage cracking. Cracking can be managed by a program that includes inspection and water chemistry. BWRVIP-29 describes a water chemistry program that contains monitoring and control guidelines for BWR water that is acceptable to the staff. BWRVIP-29 is not discussed in the BWRVIP-74 report. Therefore, in addition to the previously discussed BWRVIP reports, LR applications shall contain water chemistry programs based on monitoring and control guidelines for reactor water chemistry that are contained in BWRVIP-29.	The BSEP BWR Stress Corrosion Cracking Program includes water chemistry control as a preventive measure. The Water Chemistry Program is in accordance with the latest guidelines of the BWRVIP, this helps ensure the long-term integrity and safe operation of the Reactor Vessel and Internals components.
7	LR applicants shall identify their vessel surveillance program, which is either an ISP or plant-specific in-vessel surveillance program, applicable to the LR term.	The BSEP Reactor Vessel Surveillance Program, applicable to the LR term is an Integrated Surveillance Program.
8	LR applicants should verify that the number of cycles assumed in the original fatigue design is conservative to assure that the estimated fatigue usage for 60 years of plant operation is not underestimated. The use of alternative actions for cases where the estimated fatigue usage is projected to exceed 1.0 will require case-by-case staff review and approval. Further, a LR applicant must address environmental fatigue for the components listed in the BWRVIP-74 report for the LR period.	Thermal fatigue (including discussions of cycles, projected cumulative usage factors, environmental fatigue, etc.) is evaluated as a TLAA in Chapter 4 of the LRA. Environmental fatigue was addressed for the components listed NUREG/CR-6260 for the LR period, as specified in the draft ISG-16.
9	Appendix A to the BWRVIP-74 report indicates that a set of P-T curves should be developed for the heatup and cooldown operating conditions in the plant at a given EFPY in the LR period.	The TLAA discussion in LRA, Chapter 4, includes analyses of neutron embrittlement and of P-T curves for the LR period.
10	To demonstrate that the beltline materials meet the Charpy USE criteria specified in Appendix B of the report, the applicant shall demonstrate that the percent reduction in Charpy USE for their beltline materials are less than those specified for the limiting BWR/3-6 plates and the non-Linde 80 submerged arc welds and that the percent reduction in Charpy USE for their surveillance weld and plate are less than or equal to the values projected using the methodology in RG 1.99, Revision 2.	The discussion of Charpy USE has been provided in Chapter 4 of the LRA.
11	To obtain relief from the inservice inspection of the circumferential welds during the LR period, the BWRVIP report indicates each licensee will have to demonstrate that (1) at the end of the renewal period, the circumferential welds will satisfy the limiting conditional failure frequency for circumferential welds in the Appendix E of the staff's July 28, 1998, FSER, and (2) that they have implemented operator training and established procedures that limit the frequency of cold overpressure events to the amount specified in the staff's FSER.	The basis for the relief request for the LR period is provided in the RPV Circumferential Weld Examination Relief discussion in Chapter 4 of the LRA.
12	As indicated in the staff's March 7, 2000, letter to Carl Terry, a LR applicant shall monitor axial beltline weld embrittlement. One acceptable method is to determine the mean RTNDT of the limiting axial beltline weld at the end of the extended period of operation is less than the values specified in Table 1 of this FSER.	Refer to the discussion of the RPV Axial Weld Failure Probability TLAA in Chapter 4 of the LRA.

TABLE 1 (CONTINUED) - BWRVIP-74-A BWR REACTOR PRESSURE VESSEL INSPECTION AND FLAW EVALUATION GUIDELINES FOR LICENSE RENEWAL		
AAI #	APPLICANT ACTION ITEM	RESPONSE
13	The Charpy USE, P-T limit, circumferential weld and axial weld RPV integrity evaluations are all dependent upon the neutron fluence. The applicant may perform neutron fluence calculations using a staff approved methodology or may submit the methodology for staff review. If the applicant performs the neutron fluence calculation using a methodology previously approved by the staff, the applicant should identify the NRC letter that approved the methodology.	The TLAA discussions of LRA Chapter 4 document the evaluation of Charpy USE, P-T limit, circumferential weld, and axial weld RPV integrity for License Renewal. BSEP used a plant-specific methodology to perform fluence calculations developed by Westinghouse. This methodology was approved for use at BSEP by NRC letter from B.L. Mozafari, USNRC to J.S. Keenan, BSEP, Subject: Brunswick Steam Electric Plant, Units 1 and 2 – Issuance of Amendment RE: Pressure-Temperature Limit Curves (TAC Nos. MB5579 and MB5580), June 18, 2003. In Section 3.4 of the Safety Evaluation it states: *"This plant-specific benchmark is the most relevant and indicates that the W methodology satisfies the RG 1.190 guidelines, and is acceptable for BSEP plant-specific applications."*
14	Components that have indications that have been previously analytically evaluated in accordance with sub-section IWB-3600 of Section XI to the ASME Code until the end of the 40-year service period shall be re-evaluated for the 60 year service period corresponding to the LR term.	There are no indications that have been previously analytically evaluated in accordance with Subsection IWB-3600 of Section XI to the ASME Code until the end of the 40-year service period. Therefore, no indications require re-evaluation for the 60-year service period corresponding to the LR term.

TABLE 2 - BWRVIP-18 BWR CORE SPRAY INTERNALS INSPECTION AND FLAW EVALUATION GUIDELINES		
AAI #	APPLICANT ACTION ITEM	RESPONSE
1	The license renewal applicant is to verify that its plant is bounded by the report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-18 report to manage the effects of aging on the functionality of the core spray internals during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-18 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	See Table 1, response to AAI 1.
2	10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-18 report for the core spray internals shall ensure that the programs and activities specified as necessary in the BWRVIP-18 report are summarily described in the FSAR supplement.	See Table 1, response to AAI 2.
3	10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix C to the BWRVIP-18 report, the BWRVIP stated that there are no generic changes or additions to technical specifications associated with the core spray internals as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-18 report for the core spray internals shall ensure that the inspection strategy described in the BWRVIP-18 report does not conflict with or result in any changes to their technical specifications. If technical specification changes do result, then the applicant must ensure that those changes are included in its application for license renewal.	See Table 1, response to AAI 3.
4	Applicants referencing the BWRVIP-18 report for license renewal should identify and evaluate any potential TLAA issues which may impact the structural integrity of the subject RPV internal components. This is discussed in more detail in Section 2.4 of this SE.	No TLAA issues were identified for the RPV internal Core Spray components.

TABLE 3 - BWRVIP-25 BWR CORE PLATE INSPECTION AND FLAW EVALUATION GUIDELINES		
AAI #	APPLICANT ACTION ITEM	RESPONSE
1	The license renewal applicant is to verify that its plant is bounded by the BWRVIP-25 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-25 report to manage the effects of aging on the functionality of the core plate assembly during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMPs within the BWRVIP-25 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	See Table 1, response to AAI 1.
2	10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-25 report for the core plate will ensure that the programs and activities specified as necessary in the BWRVIP-25 report are summarily described in the FSAR supplement.	See Table 1, response to AAI 2.

Table 3 (continued)- BWRVIP-25 BWR Core Plate Inspection And Flaw Evaluation Guidelines		
AAI #	Applicant Action Item	Response
3	10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix B to the BWRVIP-25 report, the BWRVIP stated that there are no generic changes or additions to technical specifications associated with the core plate as a result of its AMR and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-25 report for the core plate will ensure that the inspection strategy described in the BWRVIP-25 report does not conflict with or result in any changes to their technical specifications (TS). If TS changes do result, then the applicant must ensure that those changes are included in its application for license renewal.	See Table 1, response to AAI 3.
4	Due to susceptibility of the rim hold-down bolts to stress relaxation, applicants referencing the BWRVIP-25 report for license renewal should identify and evaluate the projected stress relaxation as a potential TLAA issue.	Susceptibility of the rim hold-down bolts to stress relaxation was evaluated as a potential TLAA, but no TLAA was identified.
5	Until such time as an expanded technical basis for not inspecting the rim hold-down bolts is approved by the staff, applicants referencing the BWRVIP-25 report for license renewal should continue to perform inspections of the rim hold-down bolts.	BWRVIP-25 requires that an enhanced VT-1 be performed from below the core plate (or UT from above the core plate once the technique is developed) of 50% of the hold-down bolts. If cracking is detected, the remaining 50% are inspected. Re-inspection strategy is to be based on plant-specific analyses to assure that the critical number of bolts is intact to prevent lateral displacement of the core. BSEP has performed a plant-specific analysis and has determined that a minimum of 48 of 72 intact but un-preloaded core plate rim hold-down bolts are required. The number of required bolts is independent of accumulated fluence level. BSEP confirms the presence of an adequate number of bolts by performing a UT inspection through the core support ring outside diameter. The frequency for this inspection is every 10 years.

TABLE 4 - BWRVIP-26 BWR TOP GUIDE INSPECTION AND FLAW EVALUATION GUIDELINES		
AAI #	APPLICANT ACTION ITEM	RESPONSE
1	The license renewal applicant is to verify that its plant is bounded by the topical report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-26 report to manage the effects of aging on the functionality of the top guide structure during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMPs within the BWRVIP-26 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	See Table 1, response to AAI 1.
2	10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-26 report for the top guide system shall ensure that the programs and activities specified as necessary in the BWRVIP-26 report are summarily described in the FSAR supplement.	See Table 1, response to AAI 2.
3	10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix C to the BWRVIP-26 report, the BWRVIP stated that there are no generic changes or additions to technical specifications (TS) associated with the top guide as a result of its AMR and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-26 report for the top guide shall ensure that the inspection strategy described in the BWRVIP-26 report does not conflict or result in any changes to their TS. If TS changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	See Table 1, response to AAI 3.
4	Due to IASCC susceptibility of the subject safety-related components, applicants referencing the BWRVIP-26 report for license renewal should identify and evaluate the projected accumulated neutron fluence as a potential TLAA issue. This issue is discussed in more detail in Section 3.5 of this report.	Portions of the Top Guide already exceed the screening threshold provided in BWRVIP-26. This component is considered susceptible to IASCC. No TLAA was identified. BSEP will perform augmented inspections for the top guide similar to the inspections of Control Rod Drive Housing (CRDH) guide tubes. The sample size and frequency for CRDH guide tubes is a 10% sample of the total population within 12 years; one half (5%) to be completed within six years. The method of examination is an enhanced visual examination (EVT-1). The top guide inspections will focus on the high fluence region. These augmented inspections may be modified should BWRVIP 26 be revised in the future.

TABLE 5 - BWRVIP-27 BWR STANDBY LIQUID CONTROL SYSTEM/CORE PLATE ΔP INSPECTION AND FLAW EVALUATION GUIDELINES		
AAI #	APPLICANT ACTION ITEM	RESPONSE
1	The license renewal applicant is to verify that its plant is bounded by the report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP report to manage the effects of aging on the functionality of the ΔP/SLC vessel penetration/nozzle and safe-end extensions during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within this BWRVIP report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	See Table 1, response to AAI 1.
2	10 CFR 54.21(d) requires that an FSAR for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-27 report for the ΔP/SLC vessel penetration/nozzle and safe-end extensions shall ensure that the programs and activities specified as necessary in the BWRVIP-27 report are summarily described in the FSAR supplement.	See Table 1, response to AAI 2.
3	10 CFR 54.22 requires that each application for license renewal includes any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix B to the BWRVIP-27 report, the BWRVIP stated that there are no generic changes or additions to technical specifications associated with the ΔP/SLC vessel penetration/nozzle and safe-end extensions as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-27 for the ΔP/SLC vessel penetration/nozzle and safe-end extensions shall ensure that the inspection strategy described in the BWRVIP-27 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	See Table 1, response to AAI 3.
4	Due to the susceptibility of the subject components to fatigue, applicants referencing the BWRVIP-27 report for license renewal should identify and evaluate the projected fatigue cumulative usage factors as a potential TLAA issue. TLAA is discussed in Section 3.5 of the report.	The fatigue of the shroud support is a TLAA and is addressed in LRA Chapter 4.

TABLE 6 - BWRVIP-38 BWR SHROUD SUPPORT INSPECTION AND FLAW EVALUATION GUIDELINES		
AAI #	APPLICANT ACTION ITEM	RESPONSE
1	The license renewal applicant is to verify that its plant is bounded by the topical report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-38 report to manage the effects of aging on the functionality of the shroud support components during the period of extended operation, including actions planned to inspect welds that are presently inaccessible. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-38 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	See Table 1, response to AAI 1.
2	An FSAR supplement is required by 10 CFR 54.21(d) for the facility and must contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-38 report for the shroud support shall ensure that the programs and activities specified as necessary in the BWRVIP-38 report are summarily described in the FSAR supplement.	See Table 1, response to AAI 2.

TABLE 6 (CONTINUED) - BWRVIP-38 BWR SHROUD SUPPORT INSPECTION AND FLAW EVALUATION GUIDELINES		
AAI #	APPLICANT ACTION ITEM	RESPONSE
3	Each application for license renewal is required by 10 CFR 54.22 to include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix B to the BWRVIP-38 report, the BWRVIP stated that there are no generic changes or additions to technical specifications associated with the shroud support as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-38 report for the shroud support shall ensure that the inspection strategy described in the BWRVIP-38 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	See Table 1, response to AAI 3.

TABLE 7 - BWRVIP-41 BWR JET PUMP ASSEMBLY INSPECTION AND FLAW EVALUATION GUIDELINES		
AAI #	APPLICANT ACTION ITEM	RESPONSE
1	The license renewal applicant is to verify that its plant is bounded by the BWRVIP-41 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-41 report to manage the effects of aging on the functionality of the jet pump components during the period of extended operation, including actions planned to mitigate the issue concerning the inspection of welds that are presently inaccessible, and the thermal and/or neutron embrittlement TLAA. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-41 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	See Table 1, response to AAI 1.
2	10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-41 report for the jet pump components shall ensure that the programs and activities specified as necessary in the BWRVIP-41 report are summarily described in the FSAR supplement.	See Table 1, response to AAI 2.
3	10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix A to the BWRVIP-41 report, the BWRVIP stated that there are no generic changes or additions to technical specifications associated with the jet pump assembly as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-41 report for the jet pump assembly shall ensure that the inspection strategy described in the BWRVIP-41 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	See Table 1, response to AAI 3.

TABLE 8 - BWRVIP-47 BWR LOWER PLENUM INSPECTION AND FLAW EVALUATION GUIDELINES		
AAI #	APPLICANT ACTION ITEM	RESPONSE
1	The LR applicant is to verify that its plant is bounded by the BWRVIP-47 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-47 report to manage the effects of aging on the functionality of the lower plenum during the period of extended operation. LR Applicants will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMPs within the BWRVIP-47 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	See Table 1, response to AAI 1.
2	10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for LR referencing the BWRVIP-47 report for the lower plenum shall ensure that the programs and activities specified as necessary in the BWRVIP-47 document are summarily described in the FSAR supplement.	See Table 1, response to AAI 2.
3	10 CFR 54.22 requires that each LR application include any TS changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the LR application. In its Appendix A to the BWRVIP-47 report, the BWRVIP stated that there are no generic changes or additions to TSs associated with the lower plenum as a result of its AMR and that the applicant will provide the justification for plant-specific changes or additions. Those LR applicants referencing the BWRVIP-47 report for the lower plenum shall ensure that the inspection strategy described in the BWRVIP-47 report does not conflict or result in any changes to their TSs. If technical specification changes do result, then the applicant should ensure that those changes are included in its LR application.	See Table 1, response to AAI 3.
4	Due to fatigue of the subject safety-related components, applicants referencing the BWRVIP-47 report for LR should identify and evaluate the projected CUF as a potential TLAA issue. This issue is discussed in more detail in Section 3.5 of this report.	No fatigue related TLAAs were identified for the Lower Plenum.

TABLE 9 - BWRVIP-48 BWR VESSEL ID ATTACHMENT WELD INSPECTION AND FLAW EVALUATION GUIDELINES		
AAI #	APPLICANT ACTION ITEM	RESPONSE
1	The LR applicant is to verify that its plant is bounded by the BWRVIP-48 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-48 report to manage the effects of aging on the functionality of the bracket attachments during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-48 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	See Table 1, response to AAI 1.
2	10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-48 report for the bracket attachments shall ensure that the programs and activities specified as necessary in the BWRVIP-48 report are summarily described in the FSAR supplement.	See Table 1, response to AAI 2.

TABLE 9 - BWRVIP-48 BWR VESSEL ID ATTACHMENT WELD INSPECTION AND FLAW EVALUATION GUIDELINES		
AAI #	APPLICANT ACTION ITEM	RESPONSE
3	10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the license renewal application. In its Appendix A to the BWRVIP-48 report, the BWRVIP stated that there are no generic changes or additions to technical specifications associated with the bracket attachments as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-48 report for the bracket attachments shall ensure that the inspection strategy described in the BWRVIP-48 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	See Table 1, response to AAI 3.

TABLE 10 - BWRVIP-49 INSTRUMENT PENETRATION INSPECTION AND FLAW EVALUATION GUIDELINES		
AAI #	APPLICANT ACTION ITEM	RESPONSE
1	The LR applicant is to verify that its plant is bounded by the topical report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP report to manage the effects of aging on the functionality of the reactor vessel instrument penetrations during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within this BWRVIP report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	See Table 1, response to AAI 1.
2	10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-49 report for the instrument penetrations shall ensure that the programs and activities specified as necessary in the BWRVIP-49 report are summarily described in the FSAR supplement.	See Table 1, response to AAI 2.
3	10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the license renewal application. In its Appendix A to the BWRVIP-49 report, the BWRVIP stated that there are no generic changes or additions to technical specifications associated with instrument penetrations as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-49 report for the instrument penetrations shall ensure that the inspection strategy described in the BWRVIP-49 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	See Table 1, response to AAI 3.

Conclusion

Implementation of the Reactor Vessel and Internals Structural Integrity Program provides reasonable assurance that aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.29 SYSTEMS MONITORING PROGRAM

Program Description

The Systems Monitoring Program will manage aging effects such as loss of material and cracking for external surfaces of piping, heat exchangers, ductwork, tanks and other mechanical components within the scope of License Renewal. Specific guidelines for assessing the material condition of components during System Engineer walkdowns will be provided prior to the period of extended operation. The aging effects will be managed through visual inspection and monitoring of external surfaces for component leakage, rust or corrosion products, cracking, peeling coatings and corroded fasteners. These activities are conducted on a periodic basis to verify the continuing capability of in-scope components prior to the loss of component intended function. The Systems Monitoring Program is an existing, plant-specific program. There is no comparable NUREG-1801 program.

Aging Management Program Elements

The results of an evaluation of each element against the 10 elements described in Appendix A of the SRP-LR, NUREG-1800, are provided below.

- **Scope of Program**
  Systems Monitoring Program activities will apply to indoor and outdoor areas of the plant that contain systems, structures, and components/commodities that are within the scope of License Renewal. Aging management reviews for affected systems credit the Systems Monitoring Program for managing the external surface aging effects of loss of material and cracking for components such as piping, valves, ductwork, pumps, tanks, filters and heat exchangers. Walkdowns by System Engineers will be an essential part of this Program. The implementation of the Systems Monitoring Program will be accomplished by a new procedure. Before the period of extended operation, BSEP will develop a new procedure to provide inspection criteria that focus on visual detection of aging effects.

- **Preventive Actions**
  The Systems Monitoring Program is a condition monitoring program; thus there is no preventive action.

- **Parameters Monitored/Inspected**
  Engineering and other plant personnel will continue to inspect the surface conditions of mechanical system components including closure bolting through visual inspection and examination for evidence of defects and age-related degradation. The parameters monitored or inspected are selected based on AMR results, including plant and industry OE, to ensure that aging degradation

which could lead to loss of intended function will be identified and addressed. Inspections will detect aging effects/mechanisms and qualify degradations. Identified aging effects include loss of material and cracking. Piping systems will be monitored through visual inspection for evidence of leaks. Flexible HVAC connections will be monitored for cracking or other changes in material properties (including wear). Inspections performed during system walkdowns include an evaluation of the pipe covering and the environmental conditions to determine whether insulation should be removed to inspect the pipe. Insulation is not generally removed in support of system walkdowns unless there is reason to believe that the condition of the pipe is degraded. Before the period of extended operation, BSEP will develop a new procedure identifying the specific parameters to be monitored/inspected and providing inspection criteria that focus on detection of aging effects for the Systems Monitoring Program. Degradations discovered will be recorded, qualified, and dispositioned as appropriate. Implementation of the Systems Monitoring Program with the new procedure provides a link between the inspection guidelines and the specific components and associated degradations. The new procedure gives reasonable assurance the presence of aging effects will be detected and recorded.

- **Detection of Aging Effects**
  The external surface condition of systems and components will be determined by visual inspection. Before the period of extended operation, a new procedure will be developed focusing on detection of aging effects for the Systems Monitoring Program. Thus, the Systems Monitoring Program is intended to detect degradation prior to component failure.

- **Monitoring and Trending**
  The new procedure to be developed will include guidance on inspection frequency, inspection criteria that focus on detection of aging effects, and trending to provide predictability of component degradation. This will ensure aging indicators are qualified so that trending continues to be done effectively. Data from detailed system and component material condition inspections will be trended and evaluated to identify and correct problems. The results of monitoring and trending activities will be documented.

- **Acceptance Criteria**
  The acceptance criterion for visual inspections is the absence of anomalous indications that are signs of degradation. Responsibility for the evaluation of visual indications is assigned to engineering personnel. Evaluations of anomalies found during inspection determine whether analysis, repair or further inspection is required. The new procedure will require an inspection checklist for SSCs inspected during system walkdowns. Inspection checklists and procedure instructions will require inspection attributes to be qualified. The new procedure will define when corrective action is required.

- **Corrective Actions**
  Corrective actions, including root cause determinations and prevention of recurrence, are done in accordance with the Corrective Action Program. Timeliness is monitored and is commensurate with the level of significance. The new procedure will have a section addressing corrective actions. Where evaluations are performed without repair or replacement, engineering analysis reasonably assures that the SSC intended function is maintained consistent with the CLB.

- **Confirmation Process**
  Confirmation of the effectiveness of this Program is accomplished in accordance with the Corrective Action Program and Corporate Quality Assurance Procedures, review and approval processes, and administrative controls implemented in accordance with the requirements of Appendix B to 10 CFR 50.

- **Administrative Controls**
  BSEP QA procedures, review and approval processes, and administrative controls implemented in accordance with the requirements of Appendix B to 10 CFR Part 50 will continue to be adequate for the period of extended operation.

- **Operating Experience**
  BSEP OE supports the fact that engineering personnel monitor and evaluate equipment and system performance through examination and trending of condition monitoring activities, reviewing equipment failure history, analyzing availability and reliability information, and performing system walkdowns. Processes at BSEP are continually being upgraded based on industry OE and self-assessment. These processes will provide effective means of ensuring the system health for applicable license renewal systems.

Enhancements

Prior to the period of extended operation, the below-listed enhancements will be implemented in the following program elements:

<u>Program Elements Affected</u>

- **Scope of Program**
  Administrative controls will be developed for managing relevant aging effects for the mechanical components within the scope of the Program as determined during the aging management review.

- **Parameters Monitored/Inspected**
  Administrative controls will include inspections for detection of aging effects using

component attribute checklists, guidance for establishing inspection frequency, and recording of extent of material condition.

- **Acceptance Criteria**
  Program administrative controls will include qualified dispositions of inspection findings, such as, acceptable, acceptable with deficiencies, or unacceptable.

- **Corrective Action**
  Administrative controls will specifically address corrective actions for unacceptable degradations.

Conclusion

The Systems Monitoring Program, with the enhancements identified above, is consistent with the ten program elements identified in Appendix A of the SRP-LR. Inspections and evaluations will be performed by engineering personnel. Administrative controls will be developed to direct thorough and consistent inspection of SSCs, using inspection criteria that focus on detection of aging effects during periodic walkdowns. Implementation of the Program provides reasonable assurance that aging effects will be adequately managed such that the components within the scope of License Renewal will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.30 PREVENTIVE MAINTENANCE PROGRAM

Program Description

The Preventive Maintenance Program is an existing, plant-specific program that provides for inspections of structures and components or their replacement/ refurbishment during the performance of preventive maintenance activities. The PM Program assures that various aging effects are managed for a wide range of components through scheduled inspections and predetermined criteria. Specific credit for PM Program activities has been taken in the aging management review of the following systems:

System	PM Program Activity
Residual Heat Removal System	Inspect/replace the RHR seal cooling heat exchangers and clean finned surfaces of the RHR SW Booster Pump motor coolers.
High Pressure Coolant Injection System	Inspect HPCI pump lube oil strainer for flow blockage due to fouling. Also, verify flow through HPCI plug-and –cage valves that have a fine mesh cage.
Standby Liquid Control System	Inspect pulsation dampeners to manage internal corrosion and condition of rubber bladders.
Reactor Building Closed Cooling Water System	Inspect external surfaces of plate coils exposed to the air within the penetrations cooled by the Penetration Cooling System.
DG Fuel Oil System	Inspect internal and external surfaces of stainless steel relief valves.
DG Lube Oil System	Inspect internal and external surfaces of strainers.
DG Jacket Water System	Inspect DG Intake Air Intercoolers for fouling, and inspect critical components as required to manage aging before operability is challenged
Diesel Generator Starting Air System	Replace air filters, Inspect interior and exterior of filters, traps and strainers, Inspect interior and exterior of relief and check valves.
DG Intake/Exhaust System	Inspect roof-mounted exhaust silencers for loss of material,
Standby Gas Treatment System	Inspect interior surfaces of the SBGT filter housings. Inspect for degradation of elastomer seals on the SBGT filter housings.
HVAC Diesel Generator Building	Inspect interior surfaces of components in air environments for loss of material and cracking.
HVAC Reactor Building	Inspect internal surfaces of galvanized steel, carbon steel, and elastomer HVAC system components, as well as external surfaces of copper alloy heat exchanger tubing. Inspect interior surfaces of components in air environments for loss of material, cracking, and loss of heat transfer effectiveness.
HVAC Control Building	Inspect internal surfaces of components exposed to air environments for loss of material. Inspect copper alloy and aluminum external surfaces of heat exchanger components exposed to air environments for loss of heat transfer effectiveness.

System	PM Program Activity
Service Water Intake Structure, Diesel Generator Building, Control Building	Inspect sump pumps and associated piping components to insure they will not adversely impact the function of nearby safety-related components.

Aging Management Program Elements

The results of an evaluation of each element against the 10 elements described in Appendix A of the SRP-LR, NUREG-1800, are provided below.

- **Scope of Program**
  The PM Program is a plant-specific program that assures various aging effects are managed for a wide range of components, as specified by aging management reviews and credited in select aging management programs.

- **Preventive Actions**
  The PM Program includes periodic refurbishment or replacement of components specified at an interval that assures no loss of intended function.

- **Parameters Monitored/Inspected**
  The Program consists of inspections, testing, and criteria used to identify component aging degradation effects. Where necessary, activities are specified on a component-specific basis to ensure that appropriate parameters are monitored based on anticipated aging effects.

- **Detection of Aging Effects**
  The PM Program provides inspection and test criteria identified during the aging management reviews that rely on the Program for detection of the aging effects.

- **Monitoring and Trending**
  Inspection intervals are also specified as necessary to ensure that aging effects are detected prior to loss of intended function. Condition monitoring is accomplished by generic procedural requirements, as well as, specific requirements contained in PM activities.

- **Acceptance Criteria**
  Acceptance criteria are specified based on generic requirements and application-specific considerations and are intended to ensure that an acceptable level of performance is maintained at all times.

- **Corrective Actions**
  Corrective Action Program requirements ensure that corrective actions are timely and effective.

- **Confirmation Process**
  Corporate Quality Assurance (QA) Procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of Appendix B to 10 CFR 50.

- **Administrative Controls**
  Corporate QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of Appendix B to 10 CFR Part 50.

- **Operating Experience**
  OE has demonstrated that the PM Program has been effective in maintain component performance and function. The Program is subject to continual improvement under corporate procedures and initiatives.

Enhancements

Prior to the period of extended operation, the below-listed enhancements will be implemented in the following program element:

Program Elements Affected

- **Parameters Monitored/Inspected**
  PM Program activities will be added or modified as necessary to assure that age-related degradation will be managed for the systems/components that credit the Program.

Conclusion

Continued implementation of the BSEP PM Program provides reasonable assurance that aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.2.31 PHASE BUS AGING MANAGEMENT PROGRAM

Program Description

The Phase Bus Aging Management Program is credited for aging management of in-scope iso-phase and non-segregated phase bus at BSEP. The Program involves several activities conducted at least once every 10 years to identify the potential existence of aging degradation. Activities include sampling accessible bolted connections for adequate torque, visual inspections of the bus for signs of cracks, corrosion, or discoloration which may indicate overheating, and visual inspections of the bus enclosure for signs of corrosion, foreign debris, excessive dust buildup and evidence of water intrusion. The Program applies to the iso-phase bus as well as non-segregated 4.16KV and 480V phase bus within the scope of License Renewal.

Aging Management Program Elements

The results of an evaluation of the aging management activities for the Phase Bus Aging Management Program against the ten elements described in Appendix A of NUREG-1800 is provided below.

- **Scope of Program**
  This Program applies to the iso-phase bus as well as non-segregated 4.16KV and 480V phase bus within the scope of License Renewal.

- **Preventive Actions**
  The Phase Bus Aging Management Program is a condition monitoring program. No actions are taken as part of this Program to prevent or mitigate aging degradation.

- **Parameters Monitored/Inspected**
  A sample of accessible bolted connections will be checked for adequate torque. Bolted connections covered with heat shrink tape, sleeving, insulating boots, etc., are inaccessible and are not covered by this activity. This Program will also inspect the bus enclosure for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The bus itself will be inspected for signs of cracks, corrosion, or discoloration which may indicate overheating. The (internal) bus supports will be inspected for structural integrity and signs of cracking.

- **Detection of Aging Effects**
  Following issuance of a renewed operating license for BSEP, this Program will be completed before the end of the initial 40-year license term of September 8, 2016 for Unit 1 and December 27, 2014 for Unit 2, and every 10 years thereafter.

- **Monitoring and Trending**
  Trending actions are not included as part of this Program. Trending of discrepancies will be performed as required in accordance with the BSEP Corrective Action Program. Corrective action is part of the BSEP Quality Assurance (QA) Program.

- **Acceptance Criteria**
  Accessible bolted connections must meet the minimum torque specification. Additional acceptance criteria include no unacceptable indications of cracks, corrosion, foreign debris, excessive dust buildup or discoloration which may indicate overheating or evidence of water intrusion. An unacceptable indication is defined as a noted condition or situation that, if left unmanaged, could lead to a loss of License Renewal intended function.

- **Corrective Actions**
  Corrective actions will be implemented through the BSEP Corrective Action Program as required. The Corrective Action Program is implemented by the BSEP QA Program in accordance with 10 CFR 50, Appendix B.

- **Confirmation Process**
  The BSEP Corrective Action Program will verify the effectiveness of corrective actions as required. The confirmation process is considered an integral part of the Corrective Action Program. The Corrective Action Program is implemented by the BSEP QA Program in accordance with 10 CFR 50, Appendix B.

- **Administrative Controls**
  This Program will be controlled by plant procedures and the Work Management Process, the administrative controls for which are controlled by the Document Control Program. The Document Control Program is implemented by the BSEP QA Program in accordance with 10 CFR 50, Appendix B.

- **Operating Experience**
  This is a new aging management Program. There is no existing site-specific OE to validate the effectiveness of this Program. Industry OE has shown that phase bus exposed to appreciable ohmic or ambient heating during operation may experience loosening of bolted connections related to the repeated cycling of connected loads or of the ambient temperature environment. This phenomenon can occur in heavily loaded circuits (i.e., those exposed to appreciable ohmic heating or ambient heating) that are routinely cycled.

Conclusion

Implementation of the Phase Bus Aging Management Program will provide reasonable assurance that the intended functions of the iso-phase bus and non-segregated phase bus within the scope of License Renewal will be maintained consistent with the CLB through the period of extended operation.

B.2.32 FUEL POOL GIRDER TENDON INSPECTION PROGRAM

Program Description

The Fuel Pool Girder Tendon Inspection Program is an existing plant-specific program used to manage loss of prestress in the fuel pool girder tendons of each Reactor Building. The fuel pool girder tendons are not associated with the containment pressure boundary and are not within the scope of the IWL Program; however, the Fuel Pool Girder Tendon Inspection Program is conservatively based on guidance from the ASME Section XI, Subsection IWL Program. The Program visually inspects and physically tests a representative sample of tendons. Inspection results are used to project an estimated loss of prestress through the next inspection period to ensure the tendon prestressing values do not fall below the minimum design requirements.

Aging Management Program Elements

The results of an evaluation of the aging management activities for the Fuel Pool Girder Tendon Inspection Program against the ten elements described in Appendix A of NUREG-1800 is provided below.

- **Scope of Program**
  The Fuel Pool Girder Tendon Inspection Program applies to the BSEP fuel pool girder tendons and manages them for a loss of prestress.

- **Preventive Actions**
  The Fuel Pool Girder Tendon Inspection Program is a condition monitoring program; thus preventive actions are not applicable.

- **Parameters Monitored/Inspected**
  The Fuel Pool Girder Tendon Inspection Program monitors/inspects the fuel pool tendons for loss of prestress. The monitored/inspected parameters include visual examination for corrosion, pitting, or deleterious conditions, physical testing of tendon lift-off values, filler grease, and destructive testing of a tendon wire for an ultimate strength determination.

- **Detection of Aging Effects**
  The detection of aging effects is performed by the Fuel Pool Girder Tendon Inspection Program by both visual inspection and physical testing performed on a frequency commensurate with IWL.

- **Monitoring and Trending**
  The Fuel Pool Girder Tendon Inspection Program will require the loss of prestress to be trended to ensure the actual prestress does not fall below the minimum design allowable prior to the next inspection period.

- **Acceptance Criteria**
  The acceptance criteria for tested tendons is that the prestress values be above the minimum design requirements and are projected to be above the minimum design requirements through the next inspection period.

- **Corrective Actions**
  The corrective actions associated with a deficient inspection finding shall either: re-tension the tendon, replace and tension the tendon, or perform an engineering evaluation. Corrective actions including root cause determinations and prevention of recurrence are done in accordance with the Corrective Action Program. Timeliness is monitored and is commensurate with the level of significance. Where evaluations are performed without repair or replacement, engineering analysis reasonably assures that the SSC intended function is maintained consistent with the CLB.

- **Confirmation Process**
  Confirmation of the effectiveness of this Program is accomplished in accordance with the Corrective Action Program and Corporate Quality Assurance Procedures, review and approval processes, and administrative controls implemented in accordance with the requirements of Appendix B to 10 CFR 50.

- **Administrative Controls**
  BSEP QA procedures, review and approval processes, and administrative controls implemented in accordance with the requirements of Appendix B to 10 CFR Part 50 and will continue to be adequate for the period of extended operation.

- **Operating Experience**
  The Fuel Pool Girder Tendon Inspection Program is an existing program; two inspections have been performed, one in 1995 and another in 2000, based on guidance from ASME Section XI, Subsection IWL. NRC reviewed the tendon inspection program in 1995 and found the program to be: “conservative, technically sound, and thorough.” Program improvements have been implemented as a result of past inspections. Industry issues associated with the management of prestressed tendon systems are reviewed and considered for applicability to the BSEP tendon system.

Enhancements

Prior to the period of extended operation, the below-listed enhancements will be implemented in the following program element:

Program Elements Affected

- **Parameters Monitored/Inspected**
  Program activities will specify inspection frequencies, numbers of tendons to be inspected, and requirements for expansion of sample size.

- **Detection of Aging Effects**
  Program activities will identify testing required for tendon lift-off forces, measurement of tendon elongation, and determination of ultimate strength. Visual inspections will be specified for tendons, tendon anchor assemblies, surrounding concrete, and grease.

- **Monitoring and Trending**
  The Program will require loss of prestress to be trended for each inspection period and plotted against the projected values through the period of extended operation.

- **Acceptance Criteria**
  Program documentation will specify acceptable tendon lift-off forces, elongation, and ultimate strength. Visual inspection criteria for tendons, tendon anchor assemblies, surrounding concrete, and grease will be identified.

- **Corrective Action**
  Program documentation will address corrective actions if a tendon does not meet test criteria, with options to include retensioning or replacing the tendon or to establish operability via engineering evaluation.

Conclusion

The Fuel Pool Girder Tendon Inspection Program is consistent with the ten program elements identified in Appendix A of NUREG-1800. Implementation of the Program provides reasonable assurance the loss of prestress will be adequately managed such that the fuel pool girder tendons will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.3 TIME-LIMITED AGING ANALYSIS PROGRAMS

B.3.1 REACTOR COOLANT PRESSURE BOUNDARY FATIGUE MONITORING PROGRAM

Program Description

The Reactor Coolant Pressure Boundary (RCPB) Fatigue Monitoring Program includes preventive measures to mitigate fatigue cracking caused by anticipated cyclic strains in metal components of the reactor coolant pressure boundary. This is accomplished by monitoring and tracking the significant thermal and pressure transients for limiting reactor coolant pressure boundary components in order to prevent the fatigue design limit from being exceeded. The Program addresses the effects of the reactor coolant environment on component fatigue life by including, within the Program scope, environmental fatigue evaluations of the sample locations specified in NUREG/CR-6260, “Application of NUREG/CR-5999, Interim Fatigue Curves to Selected Nuclear Power Plant Components,” for older-vintage BWRs. These locations were evaluated by applying environmental correction factors to ASME Section III, Class 1 fatigue analyses, as specified in NUREG/CR-6583, “Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels,” for carbon and low-alloy steel, NUREG/CR-5704, “Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels,” for stainless steel, and methodology from Argonne National Laboratory for nickel-based alloys. Prior to exceeding the design limit, preventive and/or corrective actions are triggered by the Program. BSEP has ensured that the effects of the reactor water environment on fatigue-sensitive locations have been addressed and are managed for the period of extended operation.

NUREG-1801 Consistency

The RCPB Fatigue Monitoring Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section X.M1, with an exception.

Exceptions to NUREG-1801

<u>Program Element Affected</u>

- **Monitoring and Trending**
  The limiting locations selected for monitoring will be those with a 60-year CUF value (including environmental effects, where applicable) of 0.5 or greater. The monitoring sample may not include all locations identified in NUREG/CR-6260 that are within the scope of the Program if they do not meet this criterion.

Enhancements

Prior to the period of extended operation, the below-listed enhancements will be implemented in the following program elements:

Program Elements Affected

- **Scope of Program**
  Expand the scope of the current Fatigue Monitoring Program to include the reactor coolant pressure boundary components beyond the Reactor Pressure Vessel (RPV), including the NUREG/CR-6260 locations outside the RPV.

- **Preventive Actions**
  Enhance the administrative controls of the RCPB Fatigue Monitoring Program to address preventive actions if an analyzed component is determined to be approaching the design limit, including an option to consider operational changes to reduce the number or severity of future transients affecting the component.

- **Monitoring and Trending**
  Include a requirement in the administrative controls of the RCPB Fatigue Monitoring Program to reassess the limiting locations that are monitored, considering the analyses for RCPB locations that were added to the Program scope. Specify the selection criterion to be locations with a 60-year CUF value (including environmental effects where applicable) of 0.5 or greater.

- **Corrective Actions**
  Enhance the administrative controls of the RCPB Fatigue Monitoring Program to address corrective actions if an analyzed component is determined to be approaching the design limit, with options to revise the fatigue analysis, repair or replace the component, or perform in-service inspection of the component (with prior NRC approval). Also address criteria for increasing sample size for monitoring if a limiting location is determined to be approaching the design limit.

Operating Experience

A review was conducted of NRC Information Notices, Bulletins, and GLs for the years 2000 – 2004, but no applicable OE items were identified that relate to fatigue monitoring or to exceeding fatigue design limits. The existing Program has been effective in assuring that the fatigue analyses for the Reactor Pressure Vessel components remain below the design limit of 1.0, since the highest cumulative fatigue usage value to-date as of March, 2001 was 0.354 (for the refueling bellows support), and the highest 40-year projected fatigue usage value was 0.53 (also for the refueling bellows support).

Conclusion

Implementation of the RCPB Fatigue Monitoring Program provides reasonable assurance that the fatigue design limits will not be exceeded such that the components/commodities within the Reactor Coolant Pressure Boundary will continue to perform their intended functions consistent with the CLB for the period of extended operation.

B.3.2 ENVIRONMENTAL QUALIFICATION (EQ) PROGRAM

Program Description

The EQ Program manages component thermal, radiation, and cyclical aging through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished or replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered time-limited aging analyses (TLAAs) for License Renewal.

NUREG-1801 Consistency

The EQ Program is an existing program established to meet the requirements of 10 CFR 50.49. The BSEP EQ Program is consistent with NUREG-1801, Section X.E1.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The BSEP EQ Program has been effective at managing aging effects; OE has identified no age related equipment failures that the Program is intended to prevent. As stated in NUREG-1801, EQ programs include consideration of OE to modify qualification bases and conclusions, including qualified life. Compliance with 10 CFR 50.49 provides reasonable assurance that components can perform their intended functions during accident conditions after experiencing the effects of in-service aging. The overall effectiveness of the Program is demonstrated by the excellent OE for systems and components in the Program. In addition, the EQ Program has been and continues to be subject to periodic internal and external assessments that effect continuous improvement.

Conclusion

Continued implementation of the BSEP EQ Program provides reasonable assurance that aging effects will be managed such that the components/commodities within the scope of License Renewal will continue to perform their intended functions consistent with the CLB for the period of extended operation.

APPENDIX C

IDENTIFYING AGING EFFECTS BY MATERIAL AND ENVIRONMENT

Appendix C is not being used in this application.

APPENDIX D

TECHNICAL SPECIFICATION CHANGES

10 CFR 54.22 requires that an application for license renewal include any technical specification changes or additions necessary to manage the effects of aging during the period of extended operation. No changes to the BSEP Unit 1 or Unit 2 Technical Specifications are required to support the License Renewal Application.