U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Safety Evaluation

Related to the Subsequent License Renewal
of St. Lucie Plant, Units 1 and 2

Docket Nos. 50-335 and 50-389

Florida Power & Light Company

Revision 1

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Office of Nuclear Reactor Regulation

ABSTRACT

This safety evaluation (SE) documents the technical review by the U.S. Nuclear Regulatory Commission (NRC) staff of the St. Lucie Plant, Units 1 and 2 (St. Lucie or PSL) subsequent license renewal application (SLRA).

St. Lucie is located in Jensen Beach, FL. Units 1 and 2 are Combustion Engineering designed pressurized light-water moderated and cooled systems. Both St. Lucie units were each originally licensed and operated at 2560 megawatts thermal (MWt). In 2012, an extended power uprate (EPU) increased the reactor core thermal power to 3020 MWt for each unit. The NRC issued the initial operating licenses on March 1, 1976, for Unit 1, and April 6, 1983, for Unit 2.

Florida Power & Light Company (FPL or the applicant), by letter dated August 3, 2021 (Agencywide Documents Access and Management System (ML21215A314), as revised by letter dated October 12, 2021 (ML21285A107), and supplemented, submitted an application for subsequent license renewal for St. Lucie. FPL requested renewal for a period of 20 years beyond the current expiration at midnight on March 1, 2036, for PSL Unit 1 (Renewed Facility Operating License No. DPR-67), and at midnight on April 6, 2043, for PSL Unit 2 (Renewed Facility Operating License No. NPF-16).

This SE documents the NRC staff's technical review of the information submitted by FPL through July 13, 2022. On the basis of the review of the SLRA, the NRC staff determined that FPL has met the requirements of Title 10 of the *Code of Federal Regulations* Section 54.29(a).

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ABBREVIATIONS AND ACRONYMS

AAAC	all-aluminum allow conductor
ACRS	Advisory Committee on Reactor Safeguards
ACI	American Concrete Institute
ACR	alkali carbonate reaction
ACSR	aluminum conductor steel reinforced
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act
AERM	aging effect requiring management
AFW	Auxiliary feed water
AISC	American Institute of Steel Construction
ALARA	as lows as is reasonably achievable
AMP	aging management program
AMR	aging management review
ANSI	American National Standards Institute
AOR	analysis of record
ART	adjusted reference temperature
ASD	allowable stress design
ASME	American Society of Mechanical Engineers
ASR	alkali silica reactivity
ASTM	American Society for Testing and Materials
ATWS	anticipated transients without scram
BAC	boric acid corrosion
BE/C	best-estimate-to-calculation
BTP	branch technical position
BWR	Boiling water reactor
CASS	cast austenitic stainless steel
CC	component cooling
CCW	component cooling water
CE	combustion engineering
CEDM	control element drive mechanism
CEOG	Combustion Engineering Owners Group

CFR	*Code of Federal Regulations*
CLB	current licensing basis
CMMA	Crane Manufacturers Association of America
CMTR	certified materials testing reports
CPE	Chlorinated polyethylene
CSB	core support barrel
CST	condensate storage tank
Cu	copper
CUFs	cumulative usage factors
CUF_{en}	Environmental cumulative usage factor
CVN	charpy v-notch
CWST	city water storage tank
DBA	design basis accidents
DBE	design basis event
DOE	U.S. Department of Energy
dpa	displacement per atom
EAF	environmentally assisted fatigue
EDG	emergency diesel generator
EFPY	effective full-power years
EMDA	expanded materials degradation assessment
EPRI	Electric Power Research Institute
EPU	extended power uprates
EQ	environmental qualification
ERFBS	electric raceway fire barrier systems
FAC	flow-accelerated corrosion
FCG	fatigue crack growth
FEA	finite element analysis
FPL	Florida Power & Light Company
FR	Federal Register
FSAR	final safety analysis report
GALL	Generic Aging Lessons Learned

GALL-SLR	*Generic Aging Lessons Learned for Subsequent License Renewal Report (NUREG-2191)*
GDC	General Design Criteria
HELB	high-energy line break
HVAC	heating, ventilation, and air conditioning
I&C	instrumentation and control
IAEA	International Atomic Energy Agency
IASCC	irradiation-assisted stress corrosion cracking
ICW	intake cooling water
IGSCC	intergranular stress corrosion cracking
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
ISG	interim staff guidance
ISI	inservice inspection
K_{IC}	fracture toughness
ksi	kilopounds per square inch
kV	kilovolt
LBB	leak-before-break
LCC	lower cavity concrete
LCO	limited condition of operations
LFET	low-frequency electromagnetic testing
LOCA	loss-of-coolant accident
LRA	license renewal application
LTOP	low temperature overpressure protection
LWR	light water reactor
M/C	measure-to-calculation
MCM	million circular mils
MEB	metal enclosed bus
MeV	million electron volts
MIC	microbiologically induced corrosion
MoS2	molybdenum disulfide
MPa	megapascal

mpy	mils per year
MT	magnetic particle examination
MWt	megawatts thermal
NASA	National Aeronautics and Space Administration
NAMS	Nuclear Asset Management Suite
NDE	nondestructive examination
NEA	Nuclear Energy Agency
NEI	Nuclear Energy Institute
NESC	National Electrical Safety Code
NEPA	National Environmental Policy Act
NPP	nuclear power plant
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
NNS	nonsafety-related
OBE	operating basis earthquake
OE	operating experience
OECD	Organisation for Economic Co-operation and Development
PMRQ	preventive maintenance request
PNNL	Pacific Northwest National Laboratory
PSL	Port St. Lucie
PSW	primary shield wall
P-T	pressure-temperature
PFM	probabilistic fracture mechanics
PORV	power operated relief valve
PSW	primary and biological shield walls
PT	liquid penetrant
PTLR	pressure-temperature limits report
PTS	pressurized thermal shock
PWHT	preheat postweld heat treatment
PWR	pressurized-water reactor
PWROG	Pressurized-Water Reactor Owners Group
PWSCC	primary water stress corrosion cracking
PWST	primary water storage tank

QA	quality assurance
RAI	request of additional information
RCI	request for confirmation of information
RCCS	reactor cavity cooling system
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RCSC	Research Council for Structural Connections
RG	regulatory guide
RIS	regulatory issue summary
RIVE	radiation induced volumetric expansion
RPV	reactor pressure vessel
RTD	resistance temperature detector
RT_{NDT}	reference temperature nil ductility transition
RT_{PTS}	reference temperature for pressurized thermal shock
RVCH	reactor vessel closure head
RVI	reactor vessel internal
RWST	refueling water storage tanks
SB	shield building
SBO	station blackout
SC	structures and components
SCC	stress corrosion cracking
SE	safety evaluation
SEE IN	Significant Event Evaluation and Information Network
SFP	spent fuel pool
SG	steam generator
SI	structure integrity
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SLRBD	subsequent license renewal boundary drawings
SPEO	subsequent period of extended operation
SRM	Staff Requirements Memorandum
SRP	Standard Review Plan

SRP-SLR	Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants (NUREG-2192)
SS	stainless steel
SSC	structures, systems, and components
SSE	safe shutdown earthquake
SSSA	steel support structure assemblies
TLAA	Time-Limited Aging Analysis
TR	technical report
TS	technical specifications
TWST	treated water storage tank
UFSAR	Updated Final Safety Analysis Report
USAS	USA Standard
USE	upper-shelf energy
UT	ultrasonic examination
V&V	validation and verification
WCAP	Westinghouse Commercial Atomic Power
Zn	zinc

SECTION 1 INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This safety evaluation (SE) documents the U.S. Nuclear Regulatory Commission (NRC) staff's safety review of the subsequent license renewal application (SLRA) for St. Lucie Plant, Units 1 and 2 (St. Lucie, PSL), as filed by Florida Power & Light Company (FPL or the applicant), by letter dated August 3, 2021, (Agencywide Documents Access and Management System [ADAMS] Package Accession No. ML21215A314), as revised by letter dated October 12, 2021 (ML21285A107), and supplemented by letters dated April 7, 2022 (ML22097A202), April 13, 2022 (ML22103A014), May 19, 2022 (ML22139A083), June 13, 2022 (ML22164A802), July 11, 2022 (ML22192A078), September 22, 2022 (ML22265A134), September 28, 2022 (ML22271A399), October 26, 2022 (ML22299A037), March 27, 2023 (ML23086B990), April 21, 2023 (ML23111A129), April 30, 2023 (ML23109A113),June 14, 2023 (ML23165A114) and July 13, 2023 (ML23194A211).

FPL's application seeks to renew St. Lucie Renewed Facility Operating License Nos. DPR-67 and NPF-16 for an additional 20 years beyond the current expiration of their renewed licenses on March 1, 2036, for Unit 1, and April 6, 2043, for Unit 2. The NRC staff performed a safety review of FPL's application in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants" (10 CFR part 54). The NRC project manager for the SLRA review is Mr. Vaughn Thomas, who can be contacted by email at Vaughn.Thomas@nrc.gov.

St. Lucie is located in Jensen Beach, Florida. Units 1 and 2 are Combustion Engineering designed pressurized light-water moderated and cooled systems. Both St. Lucie units were each originally licensed and operated at 2,560 megawatts thermal (MWt). In 2012, an extended power uprate (EPU) increased the reactor core thermal power to 3,020 MWt for each unit. The staff issued the initial operating licenses on March 1, 1976, for Unit 1, and April 6, 1983, for Unit 2. The staff issued renewed operating licenses for both St. Lucie units on October 2, 2003. The St. Lucie Unit's 1 and 2 updated final safety analysis report (UFSAR) describes the plant and the site (ML22111A137 and ML22013A681).

The NRC license renewal process consists of two concurrent reviews: (1) a safety review and (2) an environmental review. NRC regulations in 10 CFR part 54 and 10 CFR part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," set forth requirements for the safety review and the environmental review, respectively. The safety review for the St. Lucie subsequent license renewal (SLR) is based on FPL's SLRA, the NRC staff's audits, responses to the staff's requests for additional information (RAIs), and responses to the staff's requests for confirmation of information (RCIs). FPL supplemented its application and provided clarifications through its responses to the staff's questions in RAIs, RCIs, audits, meetings, and docketed correspondence. The staff reviewed and considered the information submitted through April 21, 2023.

The public may view the SLRA, as well as materials related to the license renewal review, on the NRC website at https://www.nrc.gov/st-lucie-subsequent.

This SE summarizes the results of the staff's safety review of the SLRA. It describes the technical details the staff considered in evaluating the safety aspects of the units' proposed operation for an additional 20 years beyond the term of the current renewed operating licenses.

The staff reviewed the SLRA in accordance with NRC regulations and the guidance in NUREG-2192, Revision 0, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants” (SRP-SLR), dated July 2017 ML17188A158).

SE sections 2 through 4 address the staff’s evaluation of license renewal issues considered during its review of the application. SE section 5 discusses the role of the Advisory Committee on Reactor Safeguards (ACRS). SE section 6 contains the staff conclusions.

SE appendix A, “License Renewal Commitments,” contains a table showing FPL’s commitments for subsequent renewal of the operating licenses. SE appendix B, “Chronology,” contains a chronology of the principal correspondence between the staff and the applicant as well as other relevant correspondence regarding the SLRA review. SE appendix C, “Principal Contributors,” contains a list of principal contributors to the SE, and appendix D, “References,” contains a bibliography of the references that support the staff’s review.

1.2 License Renewal Background

Under the Atomic Energy Act (AEA) of 1954, as amended, and NRC regulations, the staff issues initial operating licenses for commercial power reactors for 40 years. This 40-year license term was selected based on economic and antitrust considerations rather than on technical limitations; however, some individual plant and equipment designs may have been engineered for an expected 40-year service life. NRC regulations permit license renewals that extend the initial 40-year license for up to 20 additional years per renewal. The staff issues renewed licenses only after it determines that a nuclear facility can operate safely to the end of the period of extended operation. There are no limitations in the AEA or NRC regulations on the number of times a license may be renewed.

As described in 10 CFR part 54, the focus of the staff’s license renewal safety review is to verify that the applicant has identified aging effects that could impair the ability of structures and components within the scope of license renewal to perform their intended functions and to demonstrate that these effects will be adequately managed during a period of extended operation. The regulations of 10 CFR part 54 establish the regulatory requirements for both initial license renewal and SLR.

1.2.1 Preparations for Subsequent License Renewal

In 2008 and 2011, the NRC staff and the U.S. Department of Energy (DOE) held two international conferences on reactor operations beyond 60 years to identify the most significant issues to be addressed for SLR. In 2011, the staff began collecting information to support the development of guidance documents for operation during the activity and to support a revision of 10 CFR part 54, if needed.

During 2011 through 2013, the staff performed three aging management program (AMP) effectiveness audits at plants that were already in the period of extended operation. The purpose of these information-collection audits was to provide an understanding of how plants implemented AMPs during the period of extended operation and the degradation that the AMPs identified. A summary of the staff’s observations from the first two AMP effectiveness audits can be found in the May 2013 report, “Summary of Aging Management Program Effectiveness Audits to Inform Subsequent License Renewal: R.E. Ginna NPP [Nuclear Power Plant] and Nine Mile Point Nuclear Station, Unit 1” (ML13122A007). The summary of the staff’s observations from the third audit can be found in the August 5, 2014, report, “H.B. Robinson Steam Electric

Plant, Unit 2, Aging Management Program Effectiveness Audit" (ML14017A289). In addition, on June 15, 2016, the staff issued the technical letter report, "Review of Aging Management Programs: Compendium of Insight from License Renewal Applications and from AMP Effectiveness Audits Conducted to Inform Subsequent License Renewal Guidance Documents" (ML16167A076), which provides observations from reviewing license renewal applications (LRAs) and the AMP effectiveness audits, as contextualized in NRC memorandum to file from Steven D. Bloom, dated September 27, 2016 (ML16194A124).

On May 9, 2012 (ML12159A174), and subsequently on November 1, 13, and 14, 2012, the staff met with interested stakeholders to learn their concerns and recommendations for operation from 60 to 80 years. The staff's resolution of these public comments is available in a staff memorandum from William F. Burton, Sr., to Steven D. Bloom, dated September 12, 2016 (ML16194A222).

In May 2012, the staff and the DOE cosponsored the Third International Conference on Nuclear Power Plant Life Management for Long-Term Operations, organized by the International Atomic Energy Agency (IAEA). In February 2013 and February 2015, the Nuclear Energy Institute (NEI) held forums on long-term operations and SLR. These conferences focused on the technical issues which needed to be addressed to provide assurance for safe operation beyond 60 years.

The staff also reviewed domestic operating experience as reported in licensee event reports and NRC generic communications related to failures and degradation of passive components. Similarly, the staff reviewed the following international operating experience databases: (i) the International Reporting System, jointly operated by the IAEA and the Nuclear Energy Agency (NEA), (ii) IAEA's "International Generic Ageing Lessons Learned Programme," (iii) the Organisation for Economic Co-operation and Development (OECD)/NEA "Component Operational Experience and Degradation and Ageing Programme" database, and (iv) the OECD/NEA "Cable Aging Data and Knowledge" database.

By letter dated August 6, 2014 (ML14253A104), the NEI documented the industry's views and recommendations for updating NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report" (ML103490041), and NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (ML103490036), to support SLR.

The staff, in cooperation with the DOE, completed the Expanded Materials Degradation Assessment (EMDA) in October 2014 (ML14279A321, ML14279A331, ML14279A349, ML14279A430, and ML14279A461). The EMDA used an expert elicitation process to identify materials and components that could be susceptible to significant degradation during operation beyond 60 years. The EMDA covers the reactor vessel, primary system piping, reactor vessel internals, concrete, and electrical cables and qualification. The staff used the results of the EMDA to identify gaps in the current technical knowledge or issues that are not being addressed by planned industry or DOE research. In addition, they identified AMPs that will require modification for SLR.

Based on the information gathered from these conferences, forums, and other sources from 2008 through 2014, the most significant technical issues identified as challenging operation beyond 60 years are: reactor pressure vessel embrittlement; irradiation-assisted stress corrosion cracking (IASCC) of reactor internals; concrete structures and containment degradation; and electrical cable environmental qualification, condition monitoring, and assessment.

Between 2014 and 2016, over 90 expert panels from the Office of Nuclear Reactor Regulation and Office of Research reviewed and dispositioned the comments and recommendations and published drafts of NUREG-2191, Revision 0, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," and NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (SRP-SLR). The final guidance documents were published in July 2017 (ML17187A031 and ML17187A204) to provide sufficient guidance to support the review of an SLR application.

Concurrent with the development of the technical guidance for SLR, the staff considered whether changes were needed in the regulatory framework and the license renewal rule for SLR. The staff proposed a revision to the 10 CFR part 54 rule in SECY-14-0016, "Ongoing Staff Activities to Assess Regulatory Considerations for Power Reactor Subsequent License Renewal" (ML14050A306). In the Commission's staff requirements memorandum (SRM) on SECY-14-0016 (ML14241A578), the Commission did not approve rulemaking but instead directed the staff to continue to update the license renewal guidance as needed to provide additional clarity on implementation of the license renewal regulatory framework for SLR. The SRM also directed the staff to keep the Commission informed of the progress in resolving the following technical issues related to SLR: (i) reactor pressure vessel neutron embrittlement at high fluence, (ii) IASCC of reactor internals and primary system components, (iii) concrete and containment degradation, and (iv) electrical cable qualification and condition assessment. In addition, the SRM directed the staff to keep the Commission informed regarding the staff's readiness for accepting an application and any further need for regulatory process changes, rulemaking, or research.

Consistent with Commission direction, the staff drafted updated guidance documents for SLR that addressed the four major technical issues in the Commission's SRM and, in 2017, briefed the Commission on the status of research and the development of SLR guidance, including new or revised AMPs. The final GALL-SLR Report and SRP-SLR guidance documents include new AMPs for neutron fluence and high-voltage insulators; new further evaluations for development of new plant-specific programs as needed to manage the effects of irradiation on concrete and steel structural components; and revised programmatic criteria for boiling-water reactor and pressurized-water reactor vessel internals programs to consider higher fluences during the SLR period. The SLR guidance documents provide a sound basis for developing applicant programs to manage the effects of aging associated with the technical issues and for the staff's review of applicant programs and activities proposed to manage aging during the SLR period. If new aging issues are identified through plant operating experience, industry research activities, or NRC confirmatory research, the staff will revise the guidance documents to address the new information as appropriate.

1.2.2 Safety Review

License renewal requirements for power reactors (applicable to both initial and subsequent license renewal) are based on two key principles:

- The regulatory process is adequate to ensure that the licensing bases of all currently operating plants maintain an acceptable level of safety with the possible exception of the detrimental aging effects on the functions of certain systems, structures, and components (SSCs) and a few other safety-related issues during the period of extended operation.

- The plant-specific licensing basis must be maintained during the renewal term in the same manner and to the same extent as during the original licensing term.

In implementing these two principles, 10 CFR 54.4, “Scope,” paragraph (a) defines the scope of license renewal as including the following SSCs:

- 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—
  - The integrity of the reactor coolant pressure boundary;
  - The capability to shut down the reactor and maintain it in a safe shutdown condition; or
  - The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1), § 50.67(b)(2), or § 100.11 of [10 CFR Chapter I], as applicable.
- All nonsafety-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 [§ 54.4].
- All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48), environmental qualification [EQ] (10 CFR 50.49), pressurized thermal shock [PTS] (10 CFR 50.61), anticipated transients without scram [ATWS] (10 CFR 50.62), and station blackout [SBO] (10 CFR 50.63).

As required by 10 CFR 54.21(a), a license renewal applicant must review all SSCs within the scope of 10 CFR part 54 to identify structures and components (SCs) subject to an aging management review (AMR). SCs subject to an AMR are those that perform an intended function without moving parts or without a change in configuration or properties and are not subject to replacement based on a qualified life or specified time period. In accordance with 10 CFR 54.21(a)(3), a license renewal applicant must demonstrate that the effects of aging will be adequately managed so that the intended function(s) of those SCs will be maintained consistent with the current licensing basis (CLB) for the period of extended operation.

In contrast, active equipment is adequately monitored and maintained by existing programs and is not subject to an AMR. In other words, detrimental aging effects that may affect active equipment can be readily identified and corrected through existing surveillance, performance monitoring, and maintenance programs. Surveillance and maintenance programs for active equipment, as well as other maintenance aspects of plant design and licensing basis, are required under 10 CFR part 50, “Domestic Licensing of Production and Utilization Facilities,” regulations throughout the period of extended operation.

As required by 10 CFR 54.21(d), an LRA must include a UFSAR supplement with a summary description of the applicant’s programs and activities for managing the effects of aging and an evaluation of time-limited aging analyses (TLAAs) for the period of extended operation.

License renewal regulations also require TLAA identification and updating. Section 54.3, “Definitions,” of 10 CFR specifies the criteria that determine which licensee calculations and analyses are to be considered TLAAs for the purposes of license renewal. As required by 10 CFR 54.21(c)(1), the applicant must either demonstrate that these calculations will remain valid for the period of extended operation, that they have been projected to the end of the period of extended operation, or that the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

In the St. Lucie SLRA, FPL stated that it used the process defined in the GALL-SLR Report, which summarizes staff-approved AMPs for many SCs subject to an AMR. If an applicant commits to implementing these staff-approved AMPs, the time, effort, and resources for SLRA review can be greatly reduced, improving the efficiency and effectiveness of the SLR review process. The GALL-SLR Report summarizes the aging management evaluations, programs, and activities credited for managing aging for most of the SCs used throughout the NPP industry. The report is also a quick reference for both applicant and staff reviewers on AMPs and activities that can manage aging adequately during the subsequent period of extended operation.

1.2.3 Environmental Review

Part 51 of 10 CFR contains the NRC’s regulations implementing the requirements of the National Environmental Policy Act of 1969, as amended (NEPA). The NRC staff’s environmental review is ongoing. The staff will publish its environmental review findings separately from this report.

1.3 Principal Review Matters

Part 54 of 10 CFR describes the requirements for renewal of operating licenses for NPPs. The staff’s technical review of the SLRA was performed in accordance with NRC guidance and 10 CFR part 54 requirements. Section 54.29, “Standards for issuance of a renewed license,” of 10 CFR sets forth the license renewal standards. This SE describes the results of the staff’s safety review in accordance with 10 CFR part 54 requirements.

As required by 10 CFR 54.19(a), a license renewal applicant must submit general information as specified in 10 CFR 50.33(a) through (e), (h), and (i), which FPL provided in SLRA section 1, or incorporate by reference other documents that contain the information. The NRC staff reviewed SLRA section 1 and finds that FPL submitted the required information.

Section 54.19(b) of 10 CFR requires that the SLRA 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.” On this issue, FPL stated in SLRA section 1.1.8:

> The requirements of 10 CFR 54.19(b) state that SLRAs must include, “…conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license.” The current indemnity agreement (B-76) for PSL 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 revised by Amendment No. 10, lists four license numbers. FPL has reviewed the original Indemnity Agreement and the Amendments. Neither Article VII nor Item 3 of the Attachment specifies

an expiration date for license numbers DPR-67 or NPF-16. Therefore, no changes to the Indemnity Agreement are deemed necessary as part of this SLRA. Should the license numbers be changed upon issuance of the subsequent renewed licenses, FPL requests that conforming changes be made to Item 3 of the Attachment, and any other sections of the indemnity agreement as appropriate.

If the SLR is approved, when issued, the staff intends to maintain the original license numbers. Therefore, the staff finds that conforming changes to the indemnity agreement need not be made and that the 10 CFR 54.19(b) requirements are met.

Section 54.21, "Contents of application—technical information," of 10 CFR requires that the SLRA contain: (a) an integrated plant assessment; (b) a description of any CLB changes during the staff's review of the SLRA; (c) an evaluation of TLAAs; and (d) a UFSAR supplement. SLRA sections 3 and 4 and appendix B address the license renewal requirements of 10 CFR 54.21(a), (b), and (c). The staff finds that SLRA appendix A addresses the license renewal requirements of 10 CFR 54.21(d).

Section 54.21(b) of 10 CFR requires that, each year following submittal of the SLRA and at least 3 months before the scheduled completion of the staff's review, the applicant submit an SLRA amendment identifying any CLB changes that materially affect the contents of the SLRA, including the UFSAR supplement. By letter dated September 28, 2022, FPL submitted an SLRA update that summarizes the CLB changes that have occurred during the staff's review of the SLRA (ML22271A399). The staff finds that this submission satisfies the 10 CFR 54.21(b) requirements.

Section 54.22, "Contents of application—technical specifications," of 10 CFR requires that the SLRA include any changes or additions to the technical specifications (TS) that are necessary to manage aging effects during the period of extended operation. In SLRA Appendix D, FPL states that no TS changes are necessary for issuance of the subsequent renewed operating licenses. The staff finds that this statement adequately addresses the 10 CFR 54.22 requirements.

The staff evaluated the technical information required by 10 CFR 54.21 and 10 CFR 54.22 in accordance with NRC regulations and SRP-SLR guidance. SE sections 2, 3, and 4 document the staff's evaluations of the SLRA technical information.

As required by 10 CFR 54.25, "Report of the Advisory Committee on Reactor Safeguards," the ACRS issues a report documenting its evaluation of the NRC staff's SLRA review, and SE. SE section 5 describes the role of the ACRS. SE section 6 documents the findings required by 10 CFR 54.29.

1.4 Interim Staff Guidance

License renewal is a living program. The staff, industry, and other interested stakeholders gain experience and develop lessons learned with each renewed license. The lessons learned contribute to the staff's performance goals of maintaining safety, improving effectiveness and efficiency, reducing regulatory burden, and increasing public confidence. The staff identifies lessons learned in interim staff guidance (ISG) for the staff, industry, and other interested stakeholders to use until the NRC incorporates the information into license renewal guidance documents such as the SRP-SLR and GALL-SLR Report.

Table 1.4-1 shows the current set of license renewal ISG topics, as well as the sections in this SE that address each topic.

Table 1.4-1 Current License Renewal Interim Staff Guidance

License Renewal ISG Topic (Approved LR-ISG Number)	Title	SE Section
SLR-ISG-2021-04-ELECTRICAL (ML20181A395)	Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance	SE sections 3.0.3.1.11, 3.0.3.1.12, 3.0.3.1.13, 3.0.3.1.16
SLR-ISG-2021-02-MECHANICAL (ML20181A434)	Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance	SE sections 3.0.3.1.9, 3.0.3.1.2, 3.0.3.2.7, 3.0.3.2.12, 3.0.3.2.13,
SLR-ISG-2021-03-STRUCTURES (ML20181A381)	Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance	SE sections 3.0.3.2.28
SLR-ISG-2021-01-PWRVI (ML20217L203)	Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors	SE section 3.0.3.2.8

1.5 Summary of Open Items

An item is considered open if, in the staff's judgment, the staff has not determined that the item meets all applicable regulatory requirements at the time of the issuance of this SE. After reviewing the SLRA, including additional information FPL submitted through April 21, 2023, the staff identified no open items.

1.6 Summary of Confirmatory Items

An item is considered confirmatory if, in the staff's judgment, the staff and the applicant have reached an acceptable resolution that meets all applicable regulatory requirements but, at the time of the issuance of this SE, the staff had not received the necessary documentation to confirm the resolution. After reviewing the SLRA, including additional information FPL submitted through April 21, 2023, the staff finds that no confirmatory items exist that require a formal response from FPL.

1.7 Summary of Proposed License Conditions

After reviewing the SLRA, including additional information FPL submitted through April 21, 2023, the NRC staff identified the two proposed license conditions.

a. The first license condition requires FPL, following the NRC staff's issuance of the subsequent renewed license, to include the UFSAR supplement (containing a summary of programs and activities for managing the effects of aging and an evaluation of TLAAs for the subsequent period of extended operation (as required by 10 CFR 54.21(d))) in its next periodic UFSAR update required by 10 CFR 50.71(e). The regulations at 10 CFR 50.71(e) require NPP licensees to periodically update their plant's final safety analysis report, "to assure that the information included in the report contains the latest information developed." FPL may make changes to the programs and activities described in the UFSAR update and supplement provided FPL evaluates such changes under the criteria set forth in 10 CFR 50.59, "Changes, tests and experiments," and otherwise complies with the requirements in that section.

The second license condition requires FPL to complete future activities described in the UFSAR supplement before the beginning of the subsequent period of extended operation. FPL must complete these activities no later than 6 months before the beginning of the subsequent period of extended operation and must notify the NRC in writing when it has completed those activities.

SECTION 2 STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW

2.1 Scoping and Screening Methodology

2.1.1 Introduction

Title 10 of the *Code of Federal Regulations* (10 CFR) 54.21, "Contents of Application – Technical Information," requires, in part, that a subsequent license renewal application (SLRA) contain an integrated plant assessment (IPA) of the systems, structures, and components (SSCs) within the scope of subsequent license renewal (SLR), as delineated in 10 CFR 54.4, "Scope." The IPA must identify and list those structures and components (SCs) included in the SSCs within the scope of SLR that are subject to an aging management review (AMR). Section 54.21 further requires that an SLRA describe and justify the methods used to identify the SSCs within the scope of SLR and the SCs therein subject to an AMR.

2.1.2 Summary of Technical Information in the Application

SLRA section 2.0, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results," provides the technical information required by 10 CFR 54.21. SLRA section 2.0 states, in part, that the applicant considered the following in developing the scoping and screening methodology described in SLRA section 2.0:

- 10 CFR part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," (the Rule)
- Nuclear Energy Institute (NEI) 17-01, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal" (ML17339A599), endorsed by NRC Regulatory Guide (RG) 1.188, Revision 2, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," dated April 2020 (ML20017A265)

SLRA section 2.1, "Scoping and Screening Methodology," describes the methodology PSL used for Units 1 and 2, to identify the SSCs within the scope of SLR (scoping) and the SCs therein subject to an AMR (screening).

2.1.3 Scoping and Screening Program Review

The NRC staff evaluated the applicant's scoping and screening methodology in accordance with the guidance in NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants (SRP-SLR)," section 2.1, "Scoping and Screening Methodology." The following regulations provide the basis for the acceptance criteria which the staff uses to assess the adequacy of the applicant's SLRA scoping and screening methodology:

- 10 CFR 54.4(a), as it relates to the identification of SSCs within the scope of the Rule
- 10 CFR 54.4(b), as it relates to the identification of the intended functions of SSCs within the scope of the Rule

- 10 CFR 54.21(a), as it relates to the methods used by the applicant to identify SCs subject to an AMR

The staff reviewed the information in SLRA section 2.1 to confirm that the applicant described a process, the methodology, for identifying SSCs that are within the scope of SLR in accordance with the requirements of 10 CFR 54.4(a) and SCs that are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a).

2.1.3.1 Documentation Sources Used for Scoping and Screening

2.1.3.1.1 Summary of Technical Information in the Application

SLRA section 2.1.2, "Information Sources Used for Scoping and Screening," discusses the following information sources for the SLR scoping and screening process:

- design basis documents
- controlled plant component database
- plant drawings
- fire protection nuclear safety capability assessment
- station blackout (SBO) equipment list
- environmental qualification (EQ) documentation
- original license renewal documents
- other current licensing basis (CLB) references:
    - Application for initial renewed operating licenses for PSL Units 1 and 2 and related docketed regulatory correspondence.
    - NUREG-1779, "Safety Evaluation Report Related to the License Renewal of PSL Units 1 and 2," (ML032940205).
    - NRC SEs, including staff review of PSL licensing submittals.
    - Licensing correspondence including relief requests, applicant event reports, and responses to NRC communications such as NRC bulletins, generic letters, or enforcement actions. Some of these documents may contain applicant commitments.

Engineering evaluations, calculations, and design change packages which provide additional information about the requirements and characteristics associated with the evaluated SSCs.

2.1.3.1.2 Staff Evaluation

Section 54.3 of 10 CFR, "Definitions," defines the current licensing basis (CLB) as the set of NRC requirements applicable to a specific plant and an applicant's written commitments for ensuring compliance with and operation within applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect. The CLB includes the NRC regulations contained in 10 CFR parts 2, 19, 20, 21, 26, 30, 40, 50, 51, 52, 54, 55, 70, 72, 73, 100, and appendices thereto; orders; license conditions; exemptions; and technical specifications. It also includes the plant-specific design basis information defined in 10 CFR 50.2, "Definitions," as documented in the most recent updated final safety analysis report (UFSAR) as required by 10 CFR 50.71, "Maintenance of records, making of reports," and the applicant's commitments remaining in effect that were made in docketed licensing correspondence such as applicant responses to NRC bulletins, generic letters, and enforcement actions, as well as applicant commitments documented in NRC safety evaluations (SEs) or applicant event reports.

The staff considered the scope and depth of the applicant's CLB review to verify that the methodology is sufficiently comprehensive to identify SSCs within the scope of SLR and SCs subject to an AMR. The staff determined the documentation sources provided sufficient information to ensure that the applicant identified SSCs to be included within the scope of SLR consistent with the plant's CLB.

2.1.3.1.3 Conclusion

Based on its review of the SLRA, the NRC staff finds that the applicant's consideration of document sources, including CLB information, is consistent with the Rule, the SRP-SLR, and NEI 17-01 guidance and is, therefore, acceptable.

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

SLRA section 2.1.4, "Scoping Methodology," states, in part, the following:

> The scoping process is the systematic process used to identify the PSL SSCs within the scope of the SLR. The scoping process was initially performed at the system and component level, in accordance with the scoping criteria identified in 10 CFR 54.4(a). System and structure functions and intended functions were identified from a review of the source CLB documents.

2.1.4.1 Application of Scoping Criteria in 10 CFR 54.4(a)(1)

2.1.4.1.1 Summary of Technical Information in the Application

The applicant addressed the methods used to identify SSCs which are included within the scope of SLR, in accordance with the requirements of 10 CFR 54.4(a)(1) in SLRA section 2.1.4.1, "Safety-Related – 10 CFR 54.4(a)(1)," which lists the three 10 CFR 54.4(a)(1) criteria and states, in part:

> At PSL, the SR [safety-related] components are identified in [the plant component database called the Nuclear Asset Management Suite] NAMS. The SR [safety-related] classification in NAMS was populated using a controlled procedure that is consistent with the above 10 CFR 54.4(a)(1) criteria and design verified. The [safety-related] classification is also considered a controlled attribute in the database, and any modification to a component's safety classification must be design verified.

SR classifications for systems and structures are based on system and structure descriptions and analysis in the UFSARs. SR structures are those structures listed in the UFSARs and classified as Class I. Systems and structures identified as [safety-related] in the UFSARs meet the criteria of 10 CFR 54.4(a)(1) and are included within the scope of SLR [subsequent license renewal]. SR components in NAMS were also reviewed, and the systems and structures which contained these components were also included within the scope of SLR. The review also confirmed that all plant conditions, including conditions of normal operation, internal events, anticipated operational occurrences, DBAs [design basis accidents], external events, and natural phenomena as described in the PSL Units 1 and 2 CLBs, were considered for SLR scoping.

2.1.4.1.2 Staff Evaluation

In accordance with 10 CFR 54.4(a)(1), the applicant must consider all safety-related SSCs relied on to remain functional during and following a design basis event (DBE) (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 exposures comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11, as applicable.

Regarding the identification of DBEs, SRP-SLR section 2.1.3, “Review Procedures,” states, in part:

> The set of DBEs as defined in the Rule is not limited to Chapter 15 (or equivalent) of the UFSAR. Examples of DBEs that may not be described in this chapter include external events, such as floods, storms, earthquakes, tornadoes, or hurricanes, and internal events, such as a high-energy line break. Information regarding DBEs as defined in 10 CFR 50.49(b)(1) may be found in any chapter of the facility UFSAR, the Commission’s regulations, NRC orders, exemptions, or license conditions within the CLB. These sources should also be reviewed to identify SSCs that are relied upon to remain functional during and following DBEs … to ensure the functions described in 10 CFR 54.4(a)(1).

The staff reviewed the applicant’s basis documents which describe design basis conditions in the CLB and address DBEs as defined in 10 CFR 50.49(b)(1). The UFSARs and basis documents discuss events, such as internal and external flooding, tornadoes, and missiles. The staff determined the applicant’s evaluation of DBEs is consistent with the SRP-SLR. The staff reviewed SLRA section 2.1.4.1, the applicant’s evaluation of the Rule, and CLB definitions pertaining to 10 CFR 54.4(a)(1) and determined the applicant’s CLB definition of safety-related met the definition of safety-related specified in the Rule.

2.1.4.1.3 Conclusion

Based on the review of the SLRA and the UFSARs, the staff finds the applicant’s methodology for identifying safety-related SSCs relied upon to remain functional during and following DBEs and for including those SSCs within the scope of SLR is in accordance with the requirements of 10 CFR 54.4(a)(1) and is, therefore, acceptable.

2.1.4.2 Application of the Scoping Criteria in 10 CFR 54.4(a)(2)

2.1.4.2.1 Summary of Technical Information in the Application

The applicant addressed the methods used to identify SSCs included within the scope of SLR in accordance with the requirements of 10 CFR 54.4(a)(2), in SLRA section 2.1.4.2, “Nonsafety-Related Affecting Safety-Related – 10 CFR 54.4(a)(2),” and its subsections. In addition, SLRA section 2.0 states the applicant’s methodology is consistent with the guidance contained in NEI 17-01. NEI 17-01 (which also refers to NEI 95-10, Revision 6, endorsed by the

NRC in RG 1.188) discusses the implementation of the 10 CFR 54.4(a)(2) scoping criteria to include nonsafety-related SSCs whose failure can prevent satisfactory accomplishments of safety functions.

Nonsafety-Related SSCs Supporting Safety Functions

SLRA section 2.1.4.2.1, “Nonsafety-Related SSCs with Potential to Prevent Satisfactory Accomplishment of Safety Functions,” includes a discussion of nonsafety-related systems identified in the PSL CLBs, such as cranes, high-energy line break pipe whip restraints, internally generated missile barriers, and flood mitigation features, which were included within the scope of SLR in accordance with 10 CFR 54.4(a)(2). In addition, SLRA section 2.1.4.2.1 states, in part, “In some cases, safety-related SSCs may rely on certain nonsafety-related SSCs to perform a system function” were also included within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

Nonsafety-Related SSCs Attached to Safety-Related SSCs

SLRA section 2.1.4.2.2, “Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs that Provide Structural Support for the Safety-Related SSCs,” states, in part:

> The following criteria from Appendix F of NEI 95-10, Revision 6, apply to the identification of the first seismic or equivalent anchor at PSL:
>
> - A seismic anchor is defined as a device or structure that ensures forces and moments are restrained in three orthogonal directions.
> - An equivalent anchor defined in the CLB can be credited for the 10 CFR 54.4(a)(2) evaluation.
> - An equivalent anchor may also consist of a large piece of plant equipment or a series of supports that have been evaluated as a part of a plant-specific piping design analysis to ensure forces and moments are restrained in three orthogonal directions.
> - When an equivalent anchor point for a particular piping segment is not clearly described within the existing CLB information or original design basis, the use of a combination of restraints or supports such that the NNS [nonsafety related] piping and associated structures and components [SCs] attached to SR [safety-related] piping is included in-scope up to a boundary point that encompasses at least two supports in each of three orthogonal directions.

In addition, SLRA section 2.1.4.2.2 states, in part:

> The following methods (a) through (d) were used to define end points for the portion of NNS [nonsafety-related] piping attached to SR [safety-related] piping to be included in the scope of SLR. The bounding criteria in methods (a) through (d) provide assurance that SLR scoping encompasses the NNS piping systems included in the design basis seismic analysis and is consistent with the CLB.

(a) A base-mounted component that is a rugged component and is designed not to impose loads on connecting piping. The SLR scope includes the base-mounted component as it has a support function for the SR [safety-related] piping.

(b) A flexible connection is considered a pipe stress analysis model end point when the flexible connection effectively decouples the piping system.

(c) A free end of NNS piping, such as a drain pipe that ends at an open floor drain.

(d) For NNS piping runs that are connected at both ends to SR piping, include the entire run of NNS piping.

SLRA section 2.1.4.2.2 also states the following in regard to nonsafety-related piping attached to safety-related SSCs:

> For SLR, PSL has included all the connected NNS piping and supports, up to and including the first equivalent anchor beyond the safety/nonsafety interface, within the scope of SLR pursuant to 10 CFR 54.4(a)(2). The first equivalent anchor beyond the safety/nonsafety piping interface meets the criteria specified in Section 4 of Appendix F of NEI 95-10, Revision 6. Note these piping segments are not uniquely identified on the SLRBDs [subsequent license renewal boundary drawings]. The aging effects for directly connected NNS piping are managed using the same programs which manage the SR piping. The associated NNS pipe supports are addressed in a commodity "spaces" approach, wherein all supports in the areas of concern, even those extending beyond the safety/nonsafety piping interface are included in the scope of SLR.

SLRA section 2.1.4.2.4, “Abandoned Equipment,” states, in part:

> To eliminate the potential for indoor abandoned equipment to pose a leakage or spray threat to SR equipment, a commitment will be made as part of SLR to revise plant procedures to require the periodic venting and draining of indoor abandoned equipment that is directly connected to in-service systems. Abandoned equipment that remains connected to SR SSCs will be included in the scope of license renewal as applicable per [section 2.1.4.2.3] for NNS SSCs directly connected to SR SSCs.

<u>Nonsafety-Related SSCs with the Potential for Spatial Interaction with Safety-Related SSCs</u>

SLRA section 2.1.4.2.3, “Nonsafety-Related SSCs which Have the Potential to Affect Safety-Related SSCs through Spatial Interactions,” discusses the evaluation of nonsafety-related SSCs which could potentially impact safety-related SSCs through spatial interaction (i.e., impact, spray, or leakage).

SLRA section 2.1.4.2.3 states, in part:

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

> To address this requirement of 10 CFR 54.4(a)(2), PSL has chosen the preventive option for SLR. The preventive option involves identifying the NNS SSCs which have a spatial relationship such that failure could adversely impact the performance of a SR SSC intended function and including the identified NNS SSC within the scope of SLR without consideration of plant mitigative features. The concern is that age-related degradation of NNS SSCs could lead to adverse interactions with SR SSCs which have not been previously considered.

SLRA section 2.1.4.2.3 further states, in part:

> Each mechanical system within the scope of SLR was reviewed to confirm that NNS SSCs within the system that meet the criteria of 10 CFR 54.4(a)(2) are in-scope.

SLRA section 2.1.4.2.4, "Abandoned Equipment," states, in part:

Abandoned equipment no longer directly connected to in-service systems will be verified to be vented and drained.

2.1.4.2.2 Staff Evaluation

The staff reviewed SLRA sections 2.1.4.2, 2.1.4.2.1, 2.1.4.2.2, 2.1.4.2.3, and 2.1.4.2.4, in which the applicant described the scoping methodology for nonsafety-related SSCs in accordance with 10 CFR 54.4(a)(2). During the review, the staff followed the guidance contained in SRP-SLR section 2.1.3.1.2, "Nonsafety-Related," which states that the applicant should not consider hypothetical failures but rather should base its evaluation on the plant's CLB, engineering judgment and analyses, and relevant operating experience.

<u>Nonsafety-Related SSCs Required to Perform a Function Supporting a Safety-Related Function</u>

The staff reviewed SLRA section 2.1.4.2.1, which describes nonsafety-related SSCs, such as cranes, high-energy line break pipe whip restraints, internally generated missile barriers, and flood mitigation features. These nonsafety-related, non-plant SSCs support safety functions were included within the scope of SLR in accordance with 10 CFR 54.4(a)(2). The staff confirmed the applicant reviewed the UFSARs, plant drawings, the equipment database, and other CLB documents to identify the nonsafety-related support SSCs whose failure could prevent the performance of a safety-related intended function. The staff determined the applicant identified the nonsafety-related SSCs that perform or support a safety function and included those SSCs within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The staff further reviewed SLRA section 2.1.4.2.1, which describes the method used to identify nonsafety-related SSCs required to perform a function relied upon by safety-related SSCs to perform their safety functions to be included within the scope of SLR in accordance with 10 CFR 54.4(a)(2). The staff confirmed the applicant reviewed the UFSARs, plant drawings, the equipment database, and other CLB documents to identify nonsafety-related SSCs that perform a function relied upon by safety-related SSCs and whose failure could prevent the performance of a safety function. The staff determined the applicant identified the nonsafety-related SSCs that perform a function relied upon by safety-related SSCs and whose failure could prevent the performance of a safety function and included those SSCs within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The staff determined the applicant’s methodology for identifying nonsafety-related SSCs which perform or support a safety function for inclusion within the scope of SLR is in accordance with the guidance of the SRP-SLR and the requirements of 10 CFR 54.4(a)(2).

Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs

The staff reviewed SLRA section 2.1.4.2.2, which describes the method used to identify nonsafety-related SSCs directly connected to safety-related SSCs to be included within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The staff determined that the applicant used a combination of the following to identify the bounding portion of nonsafety-related piping systems to include within the scope of SLR: seismic anchors, equivalent anchors as defined in the CLB, equivalent anchors as defined in NEI 17-01 (which refers to NEI 95-10), and the bounding conditions identified in NEI 17-01 (which refers to NEI 95-10).

In addition, the staff determined that the applicant had committed to verifying abandoned equipment directly connected to safety-related SSCs, which would be included within the scope of SLR in accordance with the methods described in SLRA section 2.1.4.2.2 or disconnected from the safety-related SSCs prior to the subsequent period of extended operation. This was addressed in SLRA, appendix A1, “Unit 1 Updated Final Safety Report Supplement,” table 19-3, “List of Unit 1 SLR Commitments and Implementation Schedule,” Commitment No. 48(a); and appendix A2, “Unit 2 Updated Final Safety Report Supplement,” table 19-3, “List of Unit 2 SLR Commitments and Implementation Schedule,” Commitment No. 48(a).

The staff determined that the applicant’s methodology for identifying and including nonsafety-related SSCs directly connected to safety-related SSCs within the scope of SLR is in accordance with the guidance of the SRP-SLR and the requirements of 10 CFR 54.4(a)(2).

Nonsafety-Related SSCs with the Potential for Spatial Interaction with Safety-Related SSCs.

The staff reviewed SLRA section 2.1.4.2.3, which describes the methods used to identify nonsafety-related SSCs with the potential for spatial interaction with safety-related SSCs to be included within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The staff determined that the applicant used a preventive option (spaces approach) to identify and evaluate the portions of nonsafety-related systems with the potential for spatial interaction with safety-related SSCs. The approach focused on the interaction between nonsafety-related and safety-related SSCs that are located in the same space, which was described as a structure that contains active or passive safety-related SSCs. The staff determined that the applicant included the nonsafety-related SSCs located within the same space as safety-related SSCs within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

In addition, the staff determined that the applicant had committed to verifying that abandoned equipment with the potential for spatial interactions with safety-related SSCs would be verified, vented and drained prior to the subsequent period of extended operation (SLRA, appendix A1, table 19-3, Commitment No. 48(b); and appendix A2, table 19-3, Commitment No. 48(b)).

The staff determined that the applicant’s methodology for identifying and including nonsafety-related SSCs with the potential for spatial interaction with safety-related SSCs within the scope of SLR is in accordance with the guidance of the SRP-SLR and the requirements of 10 CFR 54.4(a)(2).

2.1.4.2.3 Conclusion

Based on the review of the SLRA, the staff finds that the applicant's methodology for identifying, evaluating, and including nonsafety-related SSCs whose failure could prevent satisfactory accomplishment of the intended functions of safety-related SSCs within the scope of SLR is in accordance with the requirements of 10 CFR 54.4(a)(2) and is, therefore, acceptable.

2.1.4.3 Application of the Scoping Criteria in 10 CFR 54.4(a)(3)

2.1.4.3.1 Summary of Technical Information in the Application

SLRA section 2.1.4.3, "Regulated Events – 10 CFR 54.4(a)(3)," which describes the methods used to identify SSCs included within the scope of SLR in accordance with the requirements of 10 CFR 54.4(a)(3), states, in part:

> In accordance with 10 CFR 50.4(a)(3), the SSCs within the scope of [subsequent] license renewal include: All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.61), and station blackout (10 CFR 50.63).

SLRA section 2.1.4.3 further states:

The [applicant's] scoping report identifies the systems and structures required to demonstrate compliance with each of the regulated events. The report also includes references to source documents used to determine the scope of components within a system that are credited to demonstrate compliance with each of the applicable regulated events. SSCs credited in the regulated events have been classified as satisfying criteria of 10 CFR 54.4(a)(3) and have been included within the scope of SLR.

2.1.4.3.2 Staff Evaluation

The staff reviewed SLRA section 2.1.4.3, which describes the method used to identify and include within the scope of SLR those SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the agency's regulations for fire protection (10 CFR 50.48, "Fire protection"); environmental qualification (10 CFR 50.49, "Environmental qualification of electric equipment important to safety for nuclear power plants"); pressurized thermal shock (PTS) (10 CFR 50.61, "Fracture toughness requirements for protection against pressurized thermal shock events"); anticipated transients without scram (ATWS) (10 CFR 50.62, "Requirements for reduction of risk from anticipated transients without scram (ATWS) events for Light-Water-Cooled Nuclear Power Plants"); and SBO (10 CFR 50.63, "Loss of all alternating current power").

The staff determined that the applicant's scoping process considered information sources used for scoping and screening to verify that the appropriate SSCs were included within the scope of SLR and evaluated CLB information to identify SSCs that perform functions addressed in

10 CFR 54.4(a)(3) and included those SSCs within the scope of SLR. Based on the review of information contained in the SLRA and the CLB documents reviewed, the staff determined that the applicant's methodology is sufficient for identifying and including SSCs credited in performing functions within the scope of SLR in accordance with the requirements of 10 CFR 54.4(a)(3).

2.1.4.3.3 Conclusion

Based on the review of the SLRA, the staff finds that the applicant's methodology for identifying and including SSCs that are relied on to remain functional during regulated events is consistent with the requirements of 10 CFR 54.4(a)(3) and is, therefore, acceptable.

2.1.4.4 Scoping of Systems and Structures

2.1.4.4.1 Summary of Technical Information in the Application

SLRA section 2.0 states, in part:

> The scoping and screening methodology is implemented in accordance with NEI 17-01, Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for SLR.

SLRA section 2.1.1, "Introduction," states, in part:

> The initial step in the scoping process was to define the entire plant in terms of systems and structures. The systems and structures were then individually evaluated against the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), and (a)(3) to determine if the systems or structures perform or support a safety-related function, if failure of the systems or structures prevent performance of a safety-related function, or if the systems or structures perform functions that are integral to one of the five regulated events. The intended function(s) that are the bases for including systems and structures within the scope of SLR were also identified.

SLRA section 2.1.1 further states, for mechanical, structural, and electrical systems, in part:

> If any portion of a mechanical system met the scoping criteria of 10 CFR 54.4, it was included within the scope of SLR. The mechanical systems in the scope of SLR were further evaluated to determine the system components that support the identified system intended function(s).
>
> If any portion of a structure met the scoping criteria of 10 CFR 54.4, the structure was included within the scope of SLR. Structures in the scope of SLR were then further evaluated to determine those structural components that are required to perform or support the identified structure intended function(s).

Electrical and instrumentation and control (I&C) systems were scoped using the same methodology as mechanical systems and structures per the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), and (a)(3). Electrical and I&C components that are part of in-scope electrical and I&C systems and in-scope mechanical systems were included within the scope of subsequent license renewal.

2.1.4.4.2 Staff Evaluation

The staff reviewed SLRA sections 2.0 and 2.1.1 and the associated subsections, which describe the applicant's methodology for identifying SSCs within the scope of SLR to verify that it meets the requirements of 10 CFR 54.4(a). SLRA section 2.1.1 states that the applicant defined the plant in terms of systems and structures, and an evaluation was completed for all systems and structures on site to ensure that the entire plant was assessed.

The staff determined that the applicant identified the SSCs within the scope of SLR and documented the results of the scoping process in SLRA section 2.3, "Scoping and Screening Results: Mechanical Systems," SLRA section 2.4, "Scoping and Screening Results: Structures," and SLRA section 2.5, "Scoping and Screening Results: Electrical and Instrumentation & Controls." SLRA sections 2.3 through 2.5 include a description of the system or structure, a list of functions it performs, identification of intended functions, the 10 CFR 54.4(a) scoping criteria met by the system or structure, scoping boundaries, system intended functions, UFSAR references, and component types subject to an AMR.

2.1.4.4.3 Conclusion

Based on the review of the SLRA, the staff finds that the applicant's scoping methodology in Sections 2.0 and 2.1 through 2.5 is consistent with the guidance contained in the SRP-SLR and identified those SSCs that are (1) safety-related, (2) nonsafety-related whose failure could affect safety-related intended functions, and (3) necessary to demonstrate compliance with the staff's regulations for fire protection, EQ, PTS, ATWS, and SBO. The staff finds that the applicant's methodology is consistent with the requirements of 10 CFR 54.4(a) and is therefore acceptable.

2.1.5 Screening Methodology

2.1.5.1 Summary of Technical Information in the Application

SLRA section 2.1.1 states, in part:

> After completion of the scoping and boundary evaluations, the screening process was performed to evaluate the SCs within the scope of SLR to identify the long-lived and passive SCs subject to an AMR. The passive intended functions of SCs subject to AMR were also identified.

SLRA section 2.1.1 further states, in part:

> Selected components, such as equipment supports, structural items, and passive electrical components, were scoped and screened as commodities. The structural commodities were evaluated for each in-scope structure and electrical commodities were evaluated collectively.

SLRA section 2.1.5, “Screening Methodology,” states, in part:

> For mechanical systems and civil structures, this [screening] process establishes evaluation boundaries, determines the SCs that comprise the system or structure, determines which of those SCs support system/structure intended functions, and identifies specific SC intended functions. Consequently, not all of the SCs for in-scope systems or structures are in the scope of SLR because some of the components in a system or structure are outside the evaluation boundaries for SLR. Once these in-scope SCs are identified, the process then determines which SCs are subject to an AMR per the criteria of 10 CFR 54.21(a)(1).

SLRA section 2.1.5 further states, in part:

> For electrical and I&C systems, a component/commodity based approach as described in NEI 17-01 is taken. This approach establishes component/commodity evaluation boundaries, determines the electrical and I&C component commodity groups that compose in-scope systems, identifies specific component and commodity intended functions, and then determines which component commodity groups are subject to an AMR per the criteria of 10 CFR 54.21(a)(1).

SLRA section 2.1.5.3, “Electrical and Instrumentation & Controls,” states, in part:

The method used to determine which electrical and I&C components are subject to an AMR is organized based on component commodity groups. The primary difference in this method versus the one used for mechanical systems and civil structures is the order in which the component scoping and screening steps are performed. This method was selected for use with the electrical and I&C components since most electrical and I&C components are active. Thus, the method selected provides the most efficient means for determining electrical and I&C components that require an AMR. The method employed is consistent with the guidance in NEI 17-01.

2.1.5.2 Staff Evaluation

In accordance with 10 CFR 54.21, each SLRA must contain an IPA that identifies SCs that are within the scope of SLR and that are subject to an AMR. The IPA must identify components that perform an intended function without moving parts or a change in configuration or properties (passive) as well as components that are not subject to periodic replacement based on a qualified life or specified time period (long-lived). In addition, the IPA must include a description and justification of the methodology used to identify passive and long-lived SCs and a demonstration that the effects of aging on those SCs will be adequately managed so that the intended function(s) will be maintained under all design conditions imposed by the plant-specific CLB for the subsequent period of extended operation.

The NRC staff reviewed SLRA sections 2.1.1 and 2.1.5, which describe the methodology the applicant used to identify the mechanical, structural, and electrical SCs within the scope of SLR that are subject to an AMR. The applicant implemented a process for determining which SCs are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). SLRA section 2.1.5 describes the screening process, during which the applicant’s staff evaluated the component types and commodity groups included within the scope of SLR to determine which ones are passive and long-lived and therefore subject to an AMR.

Mechanical and Structural

The staff reviewed the applicant's methodology used for mechanical and structural component screening as described in SLRA sections 2.1.1; 2.1.5; 2.1.5.1, "Mechanical Systems," and 2.1.5.2, "Civil Structures." The staff determined that the applicant used the screening process described in these sections, along with the information contained in NEI 17-01 and the SRP-SLR, to identify the mechanical and structural SCs subject to an AMR. The staff determined that the applicant identified the SCs that meet the passive criteria in accordance with the guidance contained in NEI 17-01, and, among those SCs, those that are not subject to replacement based on a qualified life or specified time period (long-lived). The applicant determined that the remaining passive, long-lived components are subject to an AMR.

Electrical

The staff reviewed the applicant's methodology used for electrical component screening as described in SLRA sections 2.1.1, 2.1.5, and 2.1.5.3. The staff confirmed that the applicant used the screening process described in the SLRA along with the information contained in NEI 17-01 and the SRP-SLR to identify the electrical SSCs subject to an AMR. The staff determined that the applicant identified electrical commodity groups that meet the passive criteria in accordance with NEI 17-01, and, among those passive SCs, those SCs that are not subject to replacement based on a qualified life or specified time period (long-lived). The applicant determined that the remaining passive, long-lived components are subject to an AMR.

2.1.5.3 Conclusion

Based on the review of the SLRA, the staff finds that the applicant's screening methodology is consistent with the guidance contained in the SRP-SLR and identified the passive, long-lived components within the scope of SLR that are subject to an AMR. The staff concludes that the applicant's methodology is consistent with the requirements of 10 CFR 54.21(a)(1) and is, therefore, acceptable.

2.1.6 Summary of Evaluation Findings

Based on the review of the SLRA, the staff finds that the applicant's description and justification of the methodology for identifying SSCs within the scope of SLR and SCs subject to an AMR as described are consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1) and are, therefore, acceptable.

2.2 Plant-Level Scoping Results

2.2.1 Introduction

In SLRA section 2.1, the applicant described the methodology for identifying SSCs within the scope of SLR and subject to an AMR. In SLRA section 2.2, "Plant Level Scoping Results," the applicant applied the scoping methodology to determine which systems and structures must be included within the scope of SLR.

The staff reviewed the plant-level scoping results to determine whether the applicant properly identified the following in accordance with the requirements of 10 CFR 54.4(a):

(1) Safety-related SSCs, which are those relied upon to remain functional during and following DBEs (as defined in 10 CFR 50.49(b)(1)).

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

All SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), EQ (10 CFR 50.49), PTS (10 CFR 50.61), ATWS (10 CFR 50.62), and SBO (10 CFR 50.63).

2.2.2 Summary of Technical Information in the Application

SLRA section 2.2, table 2.2-1, "Plant Level Scoping Reports," lists the plant mechanical, structural, electrical, and I&C systems and indicates those systems for Units 1 and 2 that are within the scope of SLR.

2.2.3 Staff Evaluation

SE section 2.1 contains the staff's review and evaluation of the applicant's scoping and screening methodology. To verify that the applicant properly implemented its methodology, the staff's review focused on the implementation results shown in SLRA table 2.2-1.

The staff determined that the applicant properly identified the systems and structures within the scope of SLR in accordance with 10 CFR 54.4. The staff reviewed selected systems and structures that had not been identified as within the scope of SLR to verify whether these systems and structures have any intended functions requiring their inclusion within the scope of SLR. The staff conducted the review of the scoping implementation in accordance with SRP-SLR section 2.2, "Plant-Level Scoping Results."

The staff sampled the contents of the UFSAR based on the systems and structures listed in SLRA table 2.2-1. The staff sought to determine whether any systems or structures may have intended functions within the scope of SLR (as defined by 10 CFR 54.4) that had been omitted from the scope of SLR. The staff identified no such omissions.

2.2.4 Conclusion

Based on the review of the SLRA, the staff finds that the SLRA adequately identifies the systems and structures within the scope of SLR in accordance with 10 CFR 54.4 and is, therefore, acceptable.

2.3 Scoping and Screening Results: Mechanical Systems

This section documents the NRC staff's review of the applicant's scoping and screening results for mechanical systems. Specifically, this section discusses the following items:

- reactor coolant system
- engineered safety features
- auxiliary systems

- steam and power conversion systems

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list the passive, long-lived SCs that are within the scope of SLR and that are subject to an AMR. To verify that the applicant properly implemented its methodology, the staff focused their review on the implementation results. This focus allowed the staff to verify that the applicant identified the mechanical system SCs that met the scoping criteria and that were subject to an AMR, thus confirming that there were no omissions.

The staff's evaluation of mechanical systems was performed using the evaluation methodology described in SRP-SLR section 2.3, "Scoping and Screening Results: Mechanical Systems," and considered the system function(s) as described in the UFSAR. The objective was to determine whether the applicant, in accordance with 10 CFR 54.4, identified components and supporting structures for mechanical systems that met the SLR scoping criteria. Similarly, the staff evaluated the applicant's screening results to verify that all passive, long-lived components are subject to an AMR, as required by 10 CFR 54.21(a)(1).

In the scoping evaluation, the staff reviewed the SLRA, applicable sections of the UFSARs, SLRBDs, and other licensing-basis documents, as appropriate, for each mechanical system within the scope of SLR. The staff reviewed relevant licensing-basis documents for each mechanical system to confirm that the SLRA specifies all intended functions defined by 10 CFR 54.4(a). The review then focused on identifying any components with intended functions defined by 10 CFR 54.4(a) that the applicant may have erroneously omitted from the scoping results.

After reviewing the scoping results, the staff evaluated the applicant's screening results. For those SCs with intended functions included under 10 CFR 54.4(a), the staff verified that the applicant properly screened out only (1) SCs that have functions performed with moving parts or that have a change in configuration or properties, or (2) SCs subject to replacement after a qualified life or specified time period, as described in 10 CFR 54.21(a)(1). The staff confirmed that the applicant included SCs that do not meet either of these criteria in the AMR, as required by 10 CFR 54.21(a)(1).

2.3.1 Summary of Technical Information in the Application

SLRA section 2.3.1, "Reactor Coolant System," section 2.3.3, "Engineering Safety Features," section 2.3.3, "Auxiliary Systems," and section 2.3.4, "Steam and Power Conversion System," identify the reactor coolant system (RCS) SCs subject to an AMR for SLR. The applicant described the supporting SCs of the RCS in the following SLRA sections:

- SLRA section 2.3.1.1, "Reactor Vessels"
- SLRA section 2.3.1.2, "Reactor Vessel Internals"
- SLRA section 2.3.1.3, "Pressurizers"
- SLRA section 2.3.1.4, "Reactor Coolant Piping"
- SLRA section 2.3.1.5, "Steam Generators"
- SLRA section 2.3.2.1, "Containment Cooling"
- SLRA section 2.3.2.2, "Containment Spray"
- SLRA section 2.3.2.3, "Containment Isolation"
- SLRA section 2.3.2.4, "Safety Injection"
- SLRA section 2.3.2.5, "Containment Post-Accident Monitoring"

- SLRA section 2.3.3.1, “Chemical and Volume Control”
- SLRA section 2.3.3.2, “Component Cooling Water”
- SLRA section 2.3.3.3, “Demineralized Makeup Water”
- SLRA section 2.3.3.4, “Diesel Generators and Support Systems”
- SLRA section 2.3.3.5, “Fire Protection / Service Water”
- SLRA section 2.3.3.6, “Fuel Pool Cooling”
- SLRA section 2.3.3.7, “Instrument Air / Miscellaneous Bulk Gas Supply”
- SLRA section 2.3.3.8, “Intake Cooling Water / Emergency Cooling Canal”
- SLRA section 2.3.3.9, “Primary Makeup Water”
- SLRA section 2.3.3.10, “Sampling”
- SLRA section 2.3.3.11, “Turbine Cooling Water”
- SLRA section 2.3.3.12, “Ventilation”
- SLRA section 2.3.3.13, “Waste Management”
- SLRA section 2.3.4.1, “Main Steam”
- SLRA section 2.3.4.2, “Main Feedwater and Steam Generator Blowdown””

2.3.2 Safety Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSARs to verify that the applicant included within the scope of SLR all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of SLR to verify that the applicant included all passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology described in SLRA section 2.1 and the guidance in SRP-SLR, section 2.3, “Scoping and Screening Results: Mechanical Systems,” the staff reviewed the PSL SLRA boundary drawings, UFSAR, and additional documents, as detailed below:

SLRA section 2.3, “Scoping and Screening Results: Mechanical Systems”				
SLRA Section	SLRA Section Title	Documents Reviewed by Staff:		
		SLRA Tables	USFAR	SLRA Drawings
.0 SLRA section 2.3.1, Reactor Coolant System				
2.3.1.1	Reactor Vessel System	Table 2.3.1-1, “Reactor Vessel System Components Subject to AMR” Table 3.1.2-1, “Reactor Vessels – Summary of Aging Management Evaluation”	Unit 1, section 5.4 Unit 2, section 5.3	
2.3.1.2	Reactor Vessel Internals System	Table 2.3.1-2, “Reactor Vessel Internals” Table 3.1.2-2, “Reactor Vessel Internals – Summary of Aging Management Evaluation”	Unit 1, section 4.2.2 Unit 2, sections 3.9.5 and 4.5.2	

SLRA section 2.3, “Scoping and Screening Results: Mechanical Systems”				
2.3.1.3	Pressurizer System	Table 2.3.1-3, “Pressurizer System Components Subject to AMR” Table 3.1.2-3, “Pressurizer- Aging Management Evaluation”	Unit 1, section 5.5.2 Unit 2, section 5.4.10	
2.3.1.4	Reactor Coolant Piping System	Table 2.3.1-4, “Reactor Coolant Piping System Components Subject to AMR” Table 3.1.2-4, “Reactor Coolant Piping - Aging Management Evaluation”	Unit 1, sections 5.1, 5.3, 5.4, 5.5, and 5.6 Unit 2, sections 5.1, 5.2, and 5.4	SLR-8770-G-078 Sheet 110B SLR-8770-G-078 Sheet 110A SLR-2998-G-078 Sheets 108, 109, and 110
2.3.1.5	Steam Generators System	Table 2.3.1-5, “Steam Generator System Components Subject to AMR” Table 3.1.2-5, “Steam Generator - Aging Management Evaluation”	Unit 1, section 5.5.1 Unit 2, section 5.4.2	
.0 SLRA section 2.3.2, “Engineered Safety Features”				
2.3.2.1	Containment Cooling System	Table 2.3.2-1, “Containment Cooling System Components Subject to AMR” Table 3.2.2-1, “Containment Cooling System - Aging Management Evaluation”	Unit 1, sections 6.2, 6.3, and 9.3.5 Unit 2, sections 6.2, 6.5.2.2.1, and 5.4.7	SLR-8770-G-083 Sheet 1A SLR-8770-G-878 Sheet 1 SLR-2998-G-083 Sheet 1 SLR-2998-G-878 Sheet 1
2.3.2.2	Containment Spray System	Table 2.3.2-2, “Containment Spray System Components Subject to AMR” Table 3.2.2-2, “Containment Spray System - Aging Management Evaluation”	Unit 1 and Unit 2, section 6.2.2	SLR-8770-G-088 Sheet 1 SLR-8770-G-088 Sheet 2 SLR-8770-G-078 Sheet 105A SLR-8770-G-078 Sheet 130A SLR-8770-G-078 Sheet 130B SLR-2998-G-088 Sheet 1 SLR-2998-G-088 Sheet 2 SLR-2998-G-078 Sheet 105A SLR-2998-G-078 Sheet 130B
2.3.2.3	Containment Isolation System	Table 2.3.2-3, “Containment Isolation System Components Subject to AMR” Table 3.2.2-3, “Containment Isolation System - Aging Management Evaluation”	Unit 1, sections 6.1.6, 6.2, and 9.3.1 Unit 2, sections 6.2, 9.3.1, and 9.4	SLR-8770-G-085 Sheet 1A SLR-8770-G-088 Sheet 2 SLR-8770-G-091 Sheet 1 SLR-8770-G-878 Sheet 1 SLR-2998-G-085 Sheet 1 SLR-2998-G-088 Sheet 2 SLR-2998-G-091 Sheet 1 SLR-2998-G-878 Sheet 1 SLR-2998-G-879 Sheet 3
2.3.2.4	Safety Infection System	Table 2.3.2-4, “Safety Injection System Components Subject to AMR”	Unit 1, sections 6.3 and 9.3.5	SLR-8770-G-078 Sheet 105A SLR-8770-G-078 Sheet 120A SLR-8770-G-078 Sheet 120B SLR-8770-G-078 Sheet 121A SLR-8770-G-078 Sheet 130A SLR-8770-G-078 Sheet 130B

SLRA section 2.3, “Scoping and Screening Results: Mechanical Systems”				
		Table 3.2.2-4, “Safety Injection System - Aging Management Evaluation”	Unit 2, sections 6.3 and 5.4.7	SLR-8770-G-078 Sheet 131A SLR-8770-G-078 Sheet 131B SLR-8770-G-083 Sheet 1A SLR-8770-G-088 Sheet 1 SLR-8770-G-088 Sheet 2 SLR-2998-G-078 Sheet 105A SLR-2998-G-078 Sheet 120 SLR-2998-G-078 Sheet 122 SLR-2998-G-078 Sheet 130A SLR-2998-G-078 Sheet 130B SLR-2998-G-078 Sheet 131 SLR-2998-G-078 Sheet 132 SLR-2998-G-083 Sheet 1 SLR-2998-G-088 Sheet 1 SLR-2998-G-088 Sheet 2
2.3.2.5	Containment Post-Accident Monitoring System	Table 2.3.2-5, “Containment Post-Accident Monitoring System Components Subject to AMR” Table 3.2.2-5, “Containment Post-Accident Monitoring System - Aging Management Evaluation”	Unit 1, sections 6.2.5.2.3 and 12.2.4.1 Unit 2, sections 6.2.5.2.1, 9.3.6, and 12.3.4.2.3.1	SLR-8770-G-092 Sheet 1, Revision.0 SLR-8770-G-092 Sheet 1, Revision.0
.0 SLRA section 2.3.3, “Auxiliary Systems”				
2.3.3.1.1	Chemical and Volume Control System	Table 2.3.3-1, “Chemical and Volume Control System Components Subject to AMR” Table 3.3.2-1, “Chemical and Volume Control System – Aging Management Evaluation”	Unit 1 and Unit 2, section 9.3.4	SLR-8770-G-078 Sheet 105C, Revision 21 SLR-8770-G-078 Sheet 120B, Revision 25 SLR-8770-G-078 Sheet 121A, Revision 42 SLR-8770-G-078 Sheet 121B, Revision 35 SLR-8770-G-078 Sheet 131A, Revision 30 SLR-2998-G-078 Sheet 105C, Revision 21 SLR-2998-G-078 Sheet 120, Revision 21 SLR-2998-G-078 Sheet 121A, Revision 35 SLR-2998-G-078 Sheet 121B, Revision 30 SLR-2998-G-078 Sheet 122, Revision 30 SLR-2998-G-088, Sheet 1, Revision 51
.0 SLRA section 2.3.3.2, “Component Cooling Water”				
2.3.3.2	Component Cooling Water System	Table 2.3.3-2, “Component Cooling Water System Components Subject to AMR” Table 3.3.2-2, “Component Cooling Water System – Aging Management Evaluation”	Unit 1 and Unit 2, section 9.2.2 (Including tables 9.2-4 through 9.2-7)	SLR-8770-G-083 Sheet 1A, Revision 63 SLR-8770-G-083 Sheet 1B, Revision 65 SLR-8770-G-083 Sheet 2, Revision 6 SLR-2998-G-083 Sheet 1, Revision 48 SLR-2998-G-083 Sheet 2, Revision 45

SLRA section 2.3, "Scoping and Screening Results: Mechanical Systems"				
.0 SLRA section 2.3.3.3, "Demineralized Makeup Water"				
2.3.3.3	Demineralized Makeup Water System	Table 2.3.3.-3, "Demineralized Makeup Water System Components Subject to AMR" Table 3.3.2-3, "Demineralized Makeup Water – Aging Management Evaluation"	Unit 1, section 9.2.3 Unit 2, section 9.2.5	SLR-8770-G-096 Sheet 1A SLR-8770-G-096 Sheet 1B SLR-8770-G-096 Sheet 2A SLR-8770-G-096 Sheet 2B SLR-2998-G-084 Sheet 2 SLR-8770-G-084 Sheet 1B
.0 SLRA section 2.3.3.4, "Diesel Generators and Support Systems"				
2.3.3.4	Diesel Generators and Support Systems (See below the table for additional review, in "Additional Discussion")	Table 2.3.3-4, "Diesel Generator and Support System Components Subject to AMR" Table 3.3.2-4, "Diesel Generators and Support System – Aging Management Evaluation"	Unit 1, sections 8.3, 9.5.4, 9.5.5, 9.5.6, and 9.5.7 Unit 2, sections 8.3, 9.5.4, 9.5.5, 9.5.6, 9.5.7, and 9.5.8	SLR-8770-G-086 Sheet 1, Revision 55 SLR-8770-G-096 Sheet 1A, Revision 23 SLR-8770-G-096 Sheet 1B, Revision 21 SLR-8770-G-096 Sheet 2A, Revision 23 SLR-8770-G-096 Sheet 2B, Revision 22 SLR-8770-G-096 Sheet 1C, Revision 21 SLR-8770-G-096 Sheet 2C, Revision 18 SLR-2998-G-086 Sheet 1, Revision 56 SLR-2998-G-096 Sheet 1A, Revision 17 SLR-2998-G-096 Sheet 1B, Revision 17 SLR-2998-G-096 Sheet 2A, Revision 16 SLR-2998-G-096 Sheet 2B, Revision 17 SLR-2998-G-096 Sheet 1C, Revision 17 SLR-2998-G-096 Sheet 2C, Revision 14
.0 SLRA section 2.3.3.5, "Fire Protection / Service Water"				
2.3.3.5.	Fire Protection / Service Water System (See below the table for additional review, in "Additional Discussion")	Table 2.3.3-5, "Fire Protection and Service Water System Components Subject to AMR" Table 3.3.2-5, "Fire Protection and Service Water System – Aging Management Evaluation"	Unit 1, sections 9.2.6 and 9.5.1 and appendix 9.5A Unit 2, sections 9.2.4 and 9.5.1 and appendix 9.5A	SLR-8770-G-083 Sheet 1A SLR-8770-G-084 Sheet 1A SLR-8770-G-084 Sheet 2 SLR-8770-G-087 Sheet 1 SLR-8770-G-087 Sheet 2 SLR-8770-G-091 Sheet 1 SLR-2998-G-083 Sheet 1 SLR-2998-G-087 Sheet 1 SLR-2998-G-091 Sheet 1

SLRA section 2.3, “Scoping and Screening Results: Mechanical Systems”				
.0 SLRA section 2.3.3.6, “Fuel Pool Cooling”				
2.3.3.6	Fuel Pool Cooling System	Table 2.3.3-6, “Fuel Pool Cooling System Components Subject to AMR” Table 3.3.2-6, “Fuel Pool Cooling System – Aging Management Evaluation”	Unit 1 and Unit 2, section 9.1.3	SLR-8770-G-078 Sheet 105C SLR-8770-G-078 Sheet 140 SLR-2998-G-078 Sheet 105C SLR-2998-G-078 Sheet 140 SLR-2998-G-083 Sheet 1
.0 SLRA section 2.3.3.7, “Instrument Air / Miscellaneous Bulk Gas Supply”				
2.3.3.7	Instrument Air / Miscellaneous Bulk Gas Supply System	Table 2.3.3-7, “Instrument Air and Miscellaneous Bulk Gas Supply System Components Subject to AMR” Table 3.3.2 7, “Instrument Air and Miscellaneous Bulk Gas Supply System – Aging Management Evaluation”	Unit 1 and Unit 2, section 3.6.1	SLR-8770-G-079 Sheet 1 SLR-8770-G-085 Sheet 2A SLR-8770-G-085 Sheet 2B SLR-8770-G-085 Sheet 2C SLR-8770-G-085 Sheet 3 SLR-8770-G-085 Sheet 4A SLR-8770-G-092 Sheet 1 SLR-8770-G-878 SLR-2998-G-079 Sheet 7 SLR-2998-G-085 Sheet 2A SLR-2998-G-085 Sheet 2B SLR-2998-G-085 Sheet 2C SLR-2998-G-087 Sheet 2 SLR-2998-G-088 Sheet 1 SLR-2998-G-092 Sheet 1 SLR-2998-G-878 SLR-3509-G-117 Sheet 2
.0 SLRA section 2.3.3.8, “Intake Cooling Water / Emergency Cooling Canal”				
2.3.3.8	Intake Cooling Water / Emergency Cooling Canal System	Table 2.3.3-8, “Intake Cooling Water and Emergency Cooling Canal System Components Subject to AMR” Table 3.3.2 8, “Intake Cooling Water and Emergency Cooling Canal System – Aging Management Evaluation”	Unit 1, sections 9.2.1 and 9.2.7 Unit 2, sections 9.2.1 and 9.2.5	SLR 8770-G-082 Sheet 1 SLR 8770-G-082 Sheet 2 SLR 8770-G-093 SLR 2998-G-082 Sheet 2
.0 SLRA section 2.3.3.9, “Primary Makeup Water”				
2.3.3.9	Primary Makeup Water System	Table 2.3.3-9, “Primary Makeup Water System Components Subject to AMR” Table 3.3.2 9, “Primary Makeup Water System – Aging Management Evaluation”	Unit 1, section 9.2.5 Unit 2, section 9.2.3	SLR-8770-G-084 Sheet 1C SLR-2998-G-078 Sheet 109 SLR-2998-G-078 Sheet 121B SLR-2998-G-080 Sheet 1A SLR-2998-G-084 Sheet 1 SLR-2998-G-084 Sheet 2 SLR-2998-G-088 Sheet 1 SLR-8770-G-084 Sheet 1B
.0 SLRA section 2.3.3.10, “Sampling”				
2.3.3.10	Sampling System	Table 2.3.3-10, “Sampling System Components Subject to AMR”	Unit 1 and Unit 2, section 9.3.2	SLR-8770-G-078 Sheet 110A SLR-8770-G-078 Sheet 110B SLR-8770-G-078 Sheet 120A SLR-8770-G-078 Sheet 130B SLR-8770-G-078 Sheet 131A

SLRA section 2.3, “Scoping and Screening Results: Mechanical Systems”				
		Table 3.3.2 10, “Sampling System – Aging Management Evaluation”		SLR-8770-G-078 Sheet 131B SLR-8770-G-078 Sheet 150 SLR-2998-G-078 Sheet 108 SLR-2998-G-078 Sheet 109 SLR-2998-G-078 Sheet 110 SLR-2998-G-078 Sheet 120 SLR-2998-G-078 Sheet 130B SLR-2998-G-078 Sheet 131 SLR-2998-G-078 Sheet 132 SLR-2998-G-078 Sheet 150 SLR-2998-G-078 Sheet 153 SLR-2998-G-092 Sheet 1
.0 SLRA section 2.3.3.11, “Turbine Cooling Water”				
2.3.3.11	Turbine Cooling Water System	Table 2.3.3-11, “Turbine Cooling Water System Components Subject to AMR” Table 3.3.2 11, “Turbine Cooling Water System – Aging Management Evaluation”	Unit 1, section 9.2.4 (including tables 9.2-10 through 9.2-12) Unit 2, section 9.2.7 (including tables 9.2-12 through 9.2-14)	SLR-8770-G-089, Revision 28, Sheet 2
.0 SLRA section 2.3.3.12, “Ventilation”				
2.3.3.12	Ventilation System	Table 2.3.3-12, “Ventilation System Components Subject to AMR” Table 3.3.2 12, “Ventilation System – Aging Management Evaluation”	Unit 1, sections 6.2, 6.4, 9.4, and 15.2.13 Unit 2, sections 6.2.2, 6.4, 9.4, and 15.10	SLR-8770-G-878, Revision 39, Sheet 1 SLR-8770-G-878, Revision 39, Sheet 1 SLR-2998-G-878, Revision 38, Sheet 1 SLR-2998-G-879, Revision 33, Sheet 2 SLR-2998-G-879, Revision 32, Sheet 3
.0 SLRA section 2.3.3.13, “Waste Management”				
2.3.3.13	Waste Management System	Table 2.3.3-13, “Waste Management System Components Subject to AMR” Table 3.3.2 13, “Waste Management System – Aging Management Evaluation”	Unit 1, sections 9.3.3, 11.2, 11.3, and 11.5 Unit 2, section 9.3.3 and chapter 11	SLR-8770-G-078, Revision 22, Sheet 160A SLR-8770-G-078, Revision 25, Sheet 163A SLR-8770-G-078, Revision 35, Sheet 163B SLR-8770-G-088, Revision 35, Sheet 1 SLR-2988-G-078, Revision 10, Sheet 163A SLR-2988-G-078, Revision 10, Sheet 163B SLR-2988-G-088, Revision 33, Sheet 1
.0 SLRA section 2.3.4, “Steam and Power Conversion System”				
2.3.4.1	Main Steam System	Table 2.3.4-1, “Main Steam System Components Subject to AMR”	Unit 1 & Unit 2, sections 7.7, 10.2, and 10.3	SLR 8770-G-079 Sheet 1, Revision 63 SLR 8770-G-079 Sheet 2, Revision 58 SLR 8770-G-079 Sheet 5, Revision 41

SLRA section 2.3, “Scoping and Screening Results: Mechanical Systems”				
		Table 3.4.2-1, “Main Steam System – Aging Management Evaluation”		SLR 8770-G-079 Sheet 7, Revision 15 SLR 8770-G-080 Sheet 4, Revision 45 SLR 2998-G-079 Sheet 1, Revision 45 SLR 2998-G-079 Sheet 2, Revision 46 SLR 2998-G-079 Sheet 6, Revision 42 SLR 2998-G-079 Sheet 7, Revision 4 SLR 2998-G-080 Sheet 2B, Revision 39
7.0 SLRA section 2.3.4.2, “Main Feedwater and Steam Generator Blowdown”				
2.3.4.2	Main Feedwater and Steam Generator Blowdown System	Table 2.3.4-2, “Main Feedwater and Steam Generator System Components Subject to AMR” Table 3.4.2-2, “Main Feedwater and Steam Generator Blowdown System – Aging Management Evaluation”	Unit 1, sections 10.1, 10.4.6, and 10.4.7 Unit 2, sections 10.3.6, 10.4.7, and 10.4.8	SLR-8770-G-080 Sheet 2 SLR-8770-G-080 Sheet 3 SLR-8770-G-080 Sheet 4 SLR-8770-G-080 Sheet 5 SLR-8770-G-081 Sheet 2 SLR-8770-G-086 Sheet 1 SLR-3509-G-115 Sheet 1A SLR-2998-G-080 Sheet 2A SLR-2998-G-080 Sheet 2B SLR-2998-G-086 Sheet 1 SLR-3509-G-115 Sheet 1B
8.0 SLRA section 2.3.4.3, “Auxiliary Feedwater and Condensate”				
2.3.4.3	Auxiliary Feedwater and Condensate System	Table 2.3.4-3, “Auxiliary Feedwater and Condensate System Components Subject to AMR” Table 3.4.2-3, “Auxiliary Feedwater and Condensate System – Aging Management Evaluation”	Unit 1, sections 10.4.6 and 10.5 Unit 2, sections 10.4.7 and 10.4.9	SLR 8770-G-079 Sheet 1 SLR 8770-G-080 Sheet 1 SLR 8770-G-080 Sheet 2 SLR 8770-G-080 Sheet 3 SLR 8770-G-080 Sheet 4 SLR 2998-G-079 Sheet 1 SLR 2998-G-080 Sheet 1A SLR 2998-G-080 Sheet 2B

Additional Discussion:

SLRA section 2.3.3.4, “Diesel Generators and Support Systems”

- In addition to the information referenced above, the NRC staff’s review identified an area in which additional information was necessary to complete the review of the applicant’s scoping and screening results. The staff discussed the issue with the applicant during the virtual breakout session of February 2, 2022 (ML23067A052).

- During the breakout session staff requested that the applicant:

  - clarify the intended function of the Unit 2 screen components and where these components were reflected in SLRA table 3.3.2-4

  - clarify whether each of the four Unit 1 vent lines to the outside diesel generator building contain a similar screen component (i.e., not shown on their respective SLR boundary drawing)

  - clarify whether the Unit 1 & Unit 2 vent lines to the outside diesel generator building contain flame arrestors subject to AMR with an intended function of fire protection.

- SLRA Revision 1, Supplement 1, issued April 7, 2022, Page 4 of 391 (ML22097A202), "Description of Change," stated that:

  - Review of original vendor information indicates there are caps on the ends of the Unit 2 EDG [emergency diesel generator] day tank vents. These caps are composed of a copper alloy > 15% Zn wire mesh screen, a carbon steel cap, and an aluminum alloy body and are designed to protect the day tank vent lines. Therefore, SLRA table 3.3.2-4 is revised to add these components. The Unit 1 EDG day tanks vents do not have caps or screens.

  - There are also no flame arrestors on the day tank vent lines as they are not required per the National Fire Protection Association (NFPA) 37 and NFPA 30 codes-of-record.

- The clarifications provided above are consistent with the Unit 1 and 2 EDG boundary drawings.

  The staff finds the applicant's response acceptable because SLRA Revision 1, Supplement 1 fully addressed the subject areas of concern as discussed with the applicant during the February 2, 2022, breakout session. In addition to revising SLRA table 3.3.2-4, the applicant revised SLRA table 2.3.3-4 and SLRA sections 3.3.2.1.4, 3.3.2.2.8, and 3.3.2.2.10 to provide full closure of the issues discussed during the breakout session. The staff's concern is resolved.

- In its response to RAI B.2.3.23-2 (letter dated April 21, 2023, ML23111A129), concerning a recent failure of a PSL emergency diesel generator radiator tube, the applicant acknowledged that the radiators for the Unit 1 diesel generators were being replaced on a specified frequency since 2001 and, consequently, are not subject to an aging management review. Based on this, the applicant revised SLRA table 2.3.3-4 by adding a note stating that the Unit 1 heat exchangers (radiators) are replaced on a specified interval based on a controlled performance and condition monitoring program. This established that the Unit 1 radiators are not subject to an AMR and, consequently, only the Unit 2 radiators are subject to an AMR, as shown in the revised table. In addition, the applicant added a new commitment (No. 52) to SLRA appendix A1, table 19-3 to continue replacement of the Unit 1 emergency diesel generator radiators on a frequency of 6 years (not to exceed 6.5 years) during the subsequent period of extended operation. The staff finds the applicant's exclusion of the Unit 1 radiators from an AMR acceptable because these components are no longer considered long-lived. In addition, the staff finds the replacement frequency of 6 years (not to exceed 6.5 years) of these components acceptable, based on the previous operating experience associated with the Unit 1 radiators provided in letter dated April 21, 2023, showing that previous design changes had substantially increased the life of these radiators.

SLRA section 2.3.3.5, “Fire Protection / Service Water”

In addition to the information referenced above, the staff also reviewed the applicant’s revised amendments, “St. Lucie Plant, Unit Nos 1 and 2 - Issuance of Amendments to Revise the Renewed Facility Operating Licenses Fire Protection License Conditions,” regarding transition to a risk-informed, performance-based fire protection program in accordance with 10 CFR 50.48(c), dated October 23, 2017 (ML17248A379), to confirm that all credited fire protection and service water system features, and components are included in the scoping review.

During the review, the staff identified that the description of the applicant’s fire protection/service water does not include the following SSCs normally associated with the applicant, such as:

- Seismic support for the fire water system, including tanks, standpipes, piping, etc.
- Floor drains for removal of fire water
- Structural steel fire proofing
- Fixed emergency lighting
- Oil collection dikes and curbs (other than the reactor coolant pump oil collection system)

A virtual audit was held with the applicant on fire protection scoping and screening topics through one independent breakout session on January 24, 2022 (ML21356A577). During the audit discussion, the applicant clarified that some of the above SSCs are identified under other plant systems and stated that a supplement to its SLRA will be submitted to address the staff’s outstanding concerns. In “Subsequent License Renewal Application Revision 1 – Supplement 1,” dated April 7, 2022 (ML22097A202), the applicant provided revisions to the SLRA to include the remaining SSCs, and the staff confirmed all the above SSCs are included in the scope of license renewal and subject to an AMR.

Based on the staff’s review of the SLRA, NUREG-1779, SLRA boundary drawings, SLRA Supplement 1, and the revised amendments pertaining to Fire Protection license conditions dated October 23, 2017, the staff concludes that the applicant has appropriately identified the fire protection and service water systems and components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant has adequately identified the system components subject to an AMR in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3 Conclusion

Based on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the mechanical SCs within the scope of SLR as required by 10 CFR 54.4. The staff also concludes that the applicant identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.4 Scoping and Screening Results: Structures

This section documents the NRC staff’s review of the applicant’s scoping and screening results for structures and structural components. In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list passive, long lived SCs that are within the scope of SLR and that are subject to an AMR. To verify that the applicant properly implemented its methodology, the staff’s review focused on the implementation results. This focus allowed the staff to confirm that there were no omissions of SCs that meet the scoping criteria and that are subject to an AMR.

The staff's evaluation of the information in the SLRA was the same for all structures and structural components. The objective was to determine whether the applicant identified, in accordance with 10 CFR 54.4, structures and structural components that meet the SLR scoping criteria. Similarly, the staff evaluated the applicant's screening results to verify that all passive, long lived SCs are subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

In the scoping evaluation, the staff reviewed the applicable SLRA sections, focusing on components that were not identified as within the scope of SLR. The staff reviewed relevant licensing basis documents, including the UFSAR, for each structure to determine whether the applicant omitted from the scope of SLR components with intended functions delineated under 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the SLRA specified all intended functions delineated under 10 CFR 54.4(a).

After reviewing the scoping results, the staff evaluated the applicant's screening results. For those SCs with intended functions included under 10 CFR 54.4(a), the staff verified that the applicant properly screened out only (1) SCs that have functions performed with moving parts or that have a change in configuration or properties, or (2) SCs that are subject to replacement after a qualified life or specified time period, as described in 10 CFR 54.21(a)(1). The staff confirmed that the applicant included SCs that do not meet either of these criteria in the AMR, as required by 10 CFR 54.21(a)(1).

2.4.1 Summary of Technical Information in the Application

SLRA sections 2.4.1 through 2.4.18, as listed below, describe the structures and structural components subject to an AMR and the boundaries of the structures. SLRA tables 2.4.1-1 through 2.4.1-15 list the structures and structural component types subject to an AMR and their intended functions. SLRA tables 3.5.2-1 through 3.5.2-18 provide the results of the applicant's AMR for structures and structural components.

- SLRA section 2.4.1, "Containment Building Structures"
- SLRA section 2.4.2, "Component Cooling Water Areas"
- SLRA section 2.4.3, "Condensate Polisher Building"
- SLRA section 2.4.4, "Condensate Storage Tank Enclosures"
- SLRA section 2.4.5, "Diesel Oil Equipment Enclosures"
- SLRA section 2.4.6, "Emergency Diesel Generator Buildings"
- SLRA section 2.4.7, "Fuel Handling Buildings"
- SLRA section 2.4.8, "Intake, Discharge and Emergency Cooling Canals"
- SLRA section 2.4.9, "Intake Structures"
- SLRA section 2.4.10, "Reactor Auxiliary Buildings"
- SLRA section 2.4.11, "Steam Trestle Areas"
- SLRA section 2.4.12, "Switchyard"
- SLRA section 2.4.13, "Turbine Buildings"
- SLRA section 2.4.14, "Ultimate Heat Sink Dam (Barrier Wall)"
- SLRA section 2.4.15, "Yard Structures"
- SLRA section 2.4.16, "Component Support Commodity"
- SLRA section 2.4.17, "Fire Rated Assemblies"
- SLRA section 2.4.18, "Overhead Heavy Load Handling Systems"

2.4.1.1 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of SLR all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that the applicant included all passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology described in SLRA section 2.1 and the guidance in SRP-SLR section 4, the staff reviewed the following:

- SLRA sections 2.4.1.1 through 2.4.1.18
- SLRA tables 2.4.1-1 through 2.4.1-18
- SLRA tables 3.5.2-1 through 3.5.2-18
- UFSAR

2.4.1.2 Conclusion

Based on the staff's review of the SLRA, UFSARs, and SLR boundary drawings, the staff concludes that the applicant appropriately identified the structures and structural components within the scope of SLR, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the passive, long-lived SCs subject to an AMR in accordance with the requirements in 10 CFR 54.21(a)(1).

2.4.2 Scoping and Screening Results: Structures (only fire barrier portion

2.4.2.1 Summary of Technical Information in the Application

SLRA section 2.4, "Scoping and Screening Results: Structures," describes all structural components in areas containing safety-related SSCs, including structural supports for safety-related equipment and credited fire barriers, within the scope of SLR and subject to an AMR.

2.4.2.2 Staff Evaluation

To perform the evaluation, the staff reviewed the applicable SLRA sections and focused the review on fire barriers that had not been identified as being within the scope of SLR and subject to an AMR. Several structural components, such as seismic supports, structural steel fireproofing, and oil collection dikes and curbs, were identified as missing from the SLRA and addressed in the "Additional Discussion," section of this SE.

2.4.2.3 Conclusion

Based on the staff's review of the SLRA tables 2.4-1 thru 2.4-16, SLRA Supplement 1, and the staff's SE by the Office of Nuclear Reactor Regulation, "Transition to a Risk-Informed, Performance-based Fire Protection Program in Accordance with 10 CFR 50.48(c)," dated October 23, 2017, the staff concludes that the applicant has appropriately identified the fire barriers within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant has adequately identified the fire barriers subject to an AMR in accordance with the requirements in 10 CFR 54.21(a)(1).

2.4.3 Fire Rated Assemblies

2.4.3.1 Summary of Technical Information in the Application

Fire-rated assemblies identified by the applicant include fire barriers, fire doors, fire dampers, and penetration seals. Fire barriers are described as walls, floors, ceilings, radiant energy shields, flame impingement shields, tray and conduit fire wraps, and conduit plugs. Fire-rated assemblies are provided to prevent fire propagation between fire areas and to ensure that the function of one train of redundant equipment necessary to achieve and maintain safe shutdown conditions remains free of fire damage.

2.4.3.2 Staff Evaluation

The NRC staff reviewed table 2.4-17, "Fire Rated Assemblies Subject to Aging Management Review," and confirmed that the applicant has identified all components subject to an AMR. The staff also reviewed the applicant's amendment regarding transition to a risk-informed, performance- based fire protection program in accordance with 10 CFR 50.48(c), dated October 23, 2017, to confirm that all credited fire-rated assemblies are included in the scoping review.

During the review, the staff identified that only conduit fire wraps are included in the description of the SLRA fire-rated assemblies section. No other electric raceway fire barrier systems (ERFBS) were included. In the audit discussion held with the applicant on January 24, 2022, (ML21351A248), the applicant agreed to supplement the SLRA to include other ERFBS installed at PSL. In "Subsequent License Renewal Application Revision 1 – Supplement 1," dated April 7, 2022 (ML22097A202), the applicant provided revisions to the SLRA, and the staff confirmed that all ERFBS are included in the scope of SLR and subject to an AMR.

2.4.3.3 Conclusion

Based on the staff's review of the SLRA table 2.4-17, NUREG-1779, SLRA boundary drawings, SLRA Supplement 1, and the staff's SE by the Office of Nuclear Reactor Regulation, "Transition to a Risk-Informed, Performance-based Fire Protection Program in Accordance with 10 CFR 50.48(c)," dated October 23, 2017, the staff concludes that the applicant has appropriately identified the fire protection and service water systems and components that are within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant has adequately identified the system components subject to an AMR in accordance with the requirements in 10 CFR 54.21(a)(1).

2.5 Scoping and Screening Results: Electrical and Instrumentation and Controls

This section documents the staff's review of the applicant's scoping and screening results for electrical and I&C systems as described in SLRA section 2.5, "Scoping and Screening Results: Electrical and Instrumentation and Controls," and its subsections. Specifically, this section discusses electrical and I&C component commodity groups as described in SLRA section 2.5.1, "Electrical and I&C Component Commodity Groups."

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list passive, long-lived SCs that are within the scope of SLR and that are subject to an AMR. To verify that the applicant properly implemented its methodology, the staff's review focused on the implementation results. This focus allowed the staff to confirm that there were no omissions of electrical and I&C components that meet the scoping criteria and that are subject to an AMR.

The staff's evaluation of the information in the SLRA was the same for all electrical and I&C components. The objective was to determine whether the applicant identified, in accordance with 10 CFR 54.4, components that meet the SLR scoping criteria. Similarly, the staff evaluated the applicant's screening results to verify that all passive, long-lived SCs are subject to an AMR in accordance with 10 CFR 54.21(a)(1).

In the scoping evaluation, the staff reviewed the applicable SLRA sections, focusing on components that have not been identified as within the scope of SLR. The staff reviewed relevant licensing-basis documents, including the UFSAR, for each component to determine whether the applicant omitted from the scope of SLR components with intended functions delineated under 10 CFR 54.4(a). The staff also reviewed the licensing-basis documents to determine whether the SLRA specified all intended functions delineated under 10 CFR 54.4(a).

After reviewing the scoping results, the staff evaluated the applicant's screening results. For those SCs with intended functions included under 10 CFR 54.4(a), the staff verified that the applicant properly screened out only (1) SCs that have functions performed with moving parts or that have a change in configuration or properties, or (2) SCs that are subject to replacement after a qualified life or specified time period, as described in 10 CFR 54.21(a)(1). The staff confirmed that the applicant included SCs that do not meet either of these criteria in the AMR, as required by 10 CFR 54.21(a)(1).

2.5.1 Summary of Technical Information in the Application

SLRA section 2.5.1 describes the electrical and I&C system components that were evaluated and determined to be subject to an AMR. SLRA table 2.5-2 lists the electrical and I&C system components subject to an AMR and their intended functions. SLRA table 3.6.2-1 provides the results of the applicant's AMR for electrical and I&C system components.

2.5.2 Staff Evaluation

The staff's review of the SLRA and SLRA, Revision 1, Supplement 1, dated August 7, 2022, for this section relates to scoping and screening of electrical and I&C systems and components subject to an AMR in accordance with 10 CFR 54.4 and 10 CFR 54.21.

The staff evaluated the system functions described in the SLRA, SLRA Revision 1, Supplement 1, and the UFSARs to verify that the applicant has included within the scope of SLR all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that the applicant has included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). The staff performed its review using the guidance provided in NUREG-2192 and NEI 17-01.

Section 54.4(a) of 10 CFR identifies the plant SSCs that perform specific functions that are within the scope of license renewal. NUREG-2192 and NEI-17-01 provide the guidance on the scoping of electrical and I&C SSCs based on the license renewal intended functions identified in 10 CFR 54.4(a) and the commodity grouping of SCs that have similar functions, designs, materials of construction, and environments. NUREG-2192 table 2.1-6, "Typical Structures, Components, and Commodity Groups, and 10 CFR 54.21(a)(1)(i), "Determinations for

Integrated Plant Assessment," provide typical electrical and I&C components and commodity groups that are within the scope of license renewal. NUREG-2192, section 2.5.2.1.1, "Components Within the Scope of SBO (10 CFR 50.63)," provides the guidance to identify components in the onsite and offsite power systems that are relied upon to meet the requirements of 10 CFR 50.63 for SLR.

The applicant performed an initial plant-level scoping of the plant's systems and structures in accordance with the scoping criteria identified in 10 CFR 54.4(a) using the scoping methodology described in the SLRA, section 2.1.4, "Scoping Methodology." The applicant included in the scope of SLR (1) safety-related electrical and I&C systems described in the PSL UFSARs in accordance with 10 CFR 54.4(a)(1), (2) nonsafety-related electrical and I&C systems whose failure could prevent the accomplishment of safety functions in accordance with 10 CFR 54.4(a)(2), and (3) electrical and I&C systems credited in the regulated events identified in 10 CFR 54.4(a)(3). The applicant considered all plant conditions applicable for PSL for SLR scoping. The results of the applicant's plant-level scoping for electrical and I&C systems are provided in the SLRA section 2.2 table 2.2-1, "Plant Level Scoping Report Results." The scoping criteria in 10 CFR 54.4(a)(3) require, in part, an applicant to consider "all systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for station blackout (10 CFR 50.63)."

The applicant further evaluated the electrical and I&C systems that are included within the scope of SLR in SLRA table 2.2-1 to determine the in-scope electrical and I&C components. The applicant used a component and commodity-based approach to group the electrical and I&C components of in-scope electrical systems and in-scope mechanical systems in commodity groups based on the similarity of design and functional characteristics. In SLRA section 2.5.1.4, "Application of Screening Criteria 10 CFR 54.21(a)(1)(ii) to Electrical and I&C Commodity Groups," the applicant stated that the electrical and I&C cables and their required connections (i.e., splices, connectors, and terminal blocks) were reviewed as a single component commodity group. The in-scope electrical and I&C component commodity groups for PSL are provided in the SLRA, Revision 1, Supplement 1, table 2.5-1, "Electrical and I&C Component Commodity Groups Installed at PSL for In-Scope Systems."

SLRA table 2.5-1 includes the electrical bus (metal enclosed bus [MEB]) commodity group. In the SLRA, the applicant stated that the two categories of MEB utilized at PSL are (1) a 4.16-kilovolt (kV) non-segregated phase and (2) a 22-kV isolated (iso) phase bus. The applicant stated that the non-segregated MEB in the 4.16-KV electrical system performs an SLR intended function and is within the scope of SLR. The applicant further stated that the iso-phase bus does not perform or support an SLR intended function. According to PSL UFSAR section 8.2, the 22-kV isolated phase buses connect the station main generators in Units 1 and 2 to their respective main transformers.

The staff reviewed section 8.2 of the UFSAR and finds that the 22-kV iso-phase buses in Units 1 and 2 do not perform an SLR intended function in accordance with 10 CFR 54.4(a) because they are nonsafety-related components whose failure will not prevent satisfactory accomplishment of the functions identified in 10 CFR 54.4(a)(1), and they are not relied on to cope with or recover from an SBO or for protection. Therefore, the staff finds the exclusion of the iso-phase MEB from the SLR acceptable.

SLRA table 2.5-1 includes the switchyard commodities of switchyard bus, high-voltage insulators, transmission conductors, and MEB. In the SLRA, the applicant stated that these commodities perform an intended function for restoration of offsite power following an SBO event. In SLRA section 2.1.3.4.5, "Station Blackout (10 CFR 50.63)," the applicant described the in-scope electrical and I&C systems relied upon to meet 10 CFR 50.63 and to satisfy the criterion of 10 CFR 54.4(a)(3). The offsite power recovery paths following an SBO are highlighted in the SLRA electrical boundary drawing figure 2.5-1, "PSL Simplified One-Line Diagram (For SBO Offsite Power Recovery)." The applicant included within the scope of SLR (1) all SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with 10 CFR 50.63 and (2) the recovery path electrical equipment out to the first circuit breaker connecting to the offsite transmission system (i.e., equipment in the switchyard). The applicant stated that this path includes the circuit breakers that connect the 230-kV switchyard to the transformers (startup transformers), the transformers themselves, the intervening overhead or underground circuits between the circuit breakers and the transformers, the onsite electrical distribution system, and the associated distribution system transformers and control circuits and structures. As described in section 8.3 of the UFSAR, the startup transformers are used to step down the 230-KV incoming line voltage to 6.9-kV and 4.16-kV. The SBO recovery path highlighted in SLRA figure 2.5-1 includes the electrical equipment from the startup transformers to the 4.16-kV onsite electrical distribution system.

The staff reviewed the above-mentioned electrical and I&C systems and components relied upon to comply with 10 CFR 50.63 and the SBO information in chapters 8 and 15 of the UFSAR to verify that the applicant did not omit any equipment required to comply with 10 CFR 50.63 and the scoping criteria for SLR. The staff finds that the in-scope electrical equipment relied upon to comply with 10 CFR 50.63 for PSL conforms to the guidance in NUREG-2192 and therefore satisfies the associated criterion of 10 CFR 54.4(a)(3).

The applicant noted that it had eliminated cable tie wraps from SLR in SLRA section 2.5.1.3, "Elimination of Electrical and I&C Commodity Groups Not Applicable to St. Lucie," because they do not perform an SLR intended function. The applicant stated that cable tie wraps that serve to provide quality cable bundles and cable placement are not used for cable support and are not credited in seismic qualification of cable trays, and therefore they do not perform an SLR intended function. The staff reviewed the PSL UFSAR and confirmed that cable tie wraps are not credited in the PSL design basis. Therefore, the staff finds it acceptable to eliminate cable tie wraps from the commodity groups because the cable tie wraps do not perform an SLR intended function, as described in 10 CFR 54.4.

The staff reviewed the electrical and I&C commodity groups that the applicant identified as within the scope of SLR in table 2.5-1 and finds that these commodities are part of the in-scope electrical and I&C systems identified in SLRA table 2.2-1, which satisfy the requirements of 10 CFR 54.4(a) and are consistent with the electrical and I&C commodities listed in NUREG-2192 table 2.1-6. Therefore, the staff concludes that there is reasonable assurance that the applicant has identified the components within the scope of SLR for the electrical and I&C systems.

Section 54.21(a)(1) of 10 CFR requires the applicant to identify and list SCs that are subject to AMR. Table 2.1-6; table 2.1-3, "Specific staff guidance on Screening"; and section 2.5 of NUREG-2192 provide guidance for the screening of electrical and I&C components subject to AMR.

PSL screening methodology for the in-scope electrical and I&C components is described in SLRA section 2.1.5.3, "Electrical and Instrumentation & Controls." For each of the electrical and I&C component commodity groups in table 2.5-1, the applicant identified the intended functions provided in SLRA table 2.1-1, “Passive Structure/Component Intended Function,” and applied the screening criterion in 10 CFR 54.21(a)(1)(i) to identify the commodity groups that perform their intended functions without moving parts or without a change in configuration or properties (i.e., passive). The passive electrical and I&C component commodity groups are provided in SLRA section 2.5.1.2, “Application of Screening Criterion 10 CFR 54.21(a)(1)(i) to the Electrical and I&C Components and Commodities.” In SLRA section 2.5.1.2 the applicant further stated that the criterion of 10 CFR 54.21(a)(1)(i) is applied to identify electrical and I&C commodity groups that perform their functions without moving parts or without a change in configuration or properties.

Per 10 CFR 54.21(a)(1)(ii) in SLRA section 2.5.1.4, “Application of Screening Criteria 10 CFR 54.21(a)(1)(ii) to Electrical and I&C Commodity Groups,” the applicant excluded from AMR all of the insulated cables and connections and all of the electrical and I&C penetration assemblies that are included in the EQ program because they are subject to replacement based on a qualified life. All remaining passive electrical and I&C commodities that are not included in the EQ program meet the criterion of 10 CFR 54.21(a)(1)(ii) and are subject to AMR. The applicant provided a list of electrical and I&C components and commodity groups that required an AMR and their associated component intended functions in table 2.5-2, “Electrical and I&C System Commodities Subject to Aging Management Review.”

SLRA table 2.5-1 includes a fuse holders’ commodity group. In SLRA section 2.5.1.3, “Elimination of Electrical and I&C Commodity Groups Not Applicable to St. Lucie,” the applicant stated that the fuse holders included within the scope of SLR are those that are not considered subcomponent parts of a larger assembly, and fuse holders that were in-scope of the initial license renewal were not subject to AMR, as approved by the staff in NUREG-1779. The applicant identified new fuse holders inside a junction box that was added to the Unit 2 6.9-kV switchgear room for 125 Voltage direct current control power circuits after the initial license renewal. The screening of the new fuse holders in accordance with 10 CFR 54.21(a)(1) was omitted in SLRA, Revision 1. Recognizing that these new fuse holders are in stand-alone electrical boxes, the applicant revised SLRA section 2.5 in SLRA, Revision 1, Supplement 1 to include the new fuse holders in the electrical and I&C commodity groups subject to AMR.

In table 2.5-2 of SLRA, Revision 1, Supplement 1, the applicant provided the following list of electrical and I&C components and commodity groups that are subject to AMR:

- Insulated cables and connections - electrical continuity
- Metal enclosed bus – conductors - electrical continuity Insulate (electrical)
- Metal enclosed bus – insulators (sections used for SBO offsite power) - electrical continuity insulate (electrical)
- Cable bus – insulated cables (sections used for SBO offsite power recovery) - electrical continuity insulate (electrical)
- Fuse holders (not part of an active assembly) – electrical continuity insulate (electrical)
- High-voltage insulators (for SBO recovery) - insulate (electrical)
- Switchyard bus and connections (for SBO recovery) - electrical continuity

- Transmission conductors and connections (for SBO recovery) - electrical continuity
- Uninsulated ground conductors - electrical continuity (for lightning and fire protection)

The staff reviewed the electrical and I&C commodities subject to AMR in table 2.5-2 to verify that the applicant did not omit any passive and long-lived components that meet the screening criteria of 10 CFR 54.21(a)(1). The staff finds that the applicant's scoping and screening for electrical and I&C commodities subject to an AMR identified in table 2.5-2 of SLRA, Revision 1, Supplement 1 are consistent with NUREG-2192 table 2.1-6 and meet the criteria in 10 CFR 54.21(a)(1)(i) and 10 CFR 54.21(a)(1)(ii). Therefore, the staff concludes that there is reasonable assurance that the applicant identified the electrical and I&C components subject to an AMR in accordance with 10 CFR 54.21(a)(1).

2.5.3 Conclusion

Based on the staff's evaluation in SE section 2.5.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant appropriately identified the electrical and I&C system components within the scope of the SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.6 Conclusion for Scoping and Screening

The staff reviewed the information in SLRA chapter 2.0. The staff determined that the applicant's scoping and screening methodology is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

Based on its review, the staff finds that the applicant has adequately identified those SSCs within the scope of license renewal, as required by 10 CFR 54.4(a), and SCs subject to an AMR, as required by 10 CFR 54.21(a)(1).

SECTION 3 AGING MANAGEMENT REVIEW RESULTS

3.0 Applicant's Use of the Generic Aging Lessons Learned for Subsequent License Renewal Report

This section of the safety evaluation (SE) contains the U.S. Nuclear Regulatory Commission (NRC or the Commission) staff's evaluation of the Florida Power & Light Company (FPL or the applicant) aging management reviews (AMRs) and aging management programs (AMPs) for St. Lucie Plant, Units 1 and 2 (St. Lucie or PSL).

FPL described these AMRs and AMPs in its subsequent license renewal application (SLRA) for PSL. SLRA section 3 provides the results of the applicant's AMRs for those structures and components (SCs) identified in SLRA section 2 as within the scope of subsequent license renewal and subject to an AMR. SLRA appendix B lists the 47 AMPs that the applicant will rely on to manage or monitor the aging of passive, long-lived SCs.

The staff evaluated the applicant's AMRs for in-scope components subject to an AMR, as grouped into the following six SC categories:

(1) Reactor vessel, internals, and reactor coolant system (SE section 3.1)
(2) Engineered safety features (SE section 3.2)
(3) Auxiliary systems (SE section 3.3)
(4) Steam and power conversion systems (SE section 3.4)
(5) Containments, structures, and component supports (SE section 3.5)
(6) Electrical and instrumentation and controls (SE section 3.6)

3.0.1 Format of the Subsequent License Renewal Application

The applicant submitted an application based on the guidance in NUREG-2192, Revision 0, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants," issued July 2017 (ML17188A158) (SRP-SLR), and the guidance provided by Nuclear Energy Institute (NEI) 17-01, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal," issued March 2017 (ML17339A599), which the NRC endorsed as acceptable for use in performing AMRs and drafting SLRAs in NRC Regulatory Guide (RG) 1.188, Revision 2, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," dated April 2020 (ML20017A265).

The organization of SLRA section 3 follows the recommendations in NEI 17-01 and parallels the section structure of SRP-SLR Chapter 3. SLRA section 3 presents the results of the applicant's AMRs in the following two table types:

(1) Table 1s: table 3.x.1, where "3" indicates the SLRA section number, "x" indicates the subsection number from the GALL-SLR Report, and "1" indicates that this is the first table type in SLRA section 3.

(2) Table 2s: table 3.x.2-y, where "3" indicates the SLRA section number, "x" indicates the subsection number from the GALL-SLR Report, "2" indicates that this is the second table type in SLRA Section 3, and "y" indicates the table number for a specific system.

In its table 1s, the applicant summarized the alignment between the PSL AMR results and the GALL-SLR Report AMR items. The applicant included a "discussion" column to document whether each of the AMR summary items in the table 1s is consistent with the GALL-SLR Report, consistent with the GALL-SLR Report but uses a different AMP to manage aging effects or is not applicable at PSL. Each table 1 item summarizes how table 2 items with similar materials, environments, and aging mechanisms compare to the GALL-SLR Report and how they will be managed for aging.

In its table 2s, the applicant provided the detailed results of the AMR for those SCs identified in SLRA section 2 as being subject to an AMR. Table 2 includes a column linking each AMR item to the associated table 1 summary item.

3.0.2 Staff's Review Process

The staff conducted three types of evaluations of FPL's AMR items and the AMPs listed in SLRA appendix A and appendix B that are credited for managing the effects of aging:

(1) For items that the applicant stated are consistent with the GALL-SLR Report, the staff conducted either an audit or a technical review to determine consistency. GALL-SLR Report AMPs and AMR analyses are one acceptable method for managing the effects of aging, thus the staff did not re-evaluate those AMPs and AMRs that were determined to be consistent with the GALL-SLR Report.

(2) For items that the applicant stated were consistent with the GALL-SLR Report with exceptions, enhancements, or both, the staff conducted either an audit or a technical review of the item to determine consistency. Additionally, the staff conducted either an audit or a technical review of the applicant's technical justifications for the exceptions or the adequacy of the enhancements.

    The SRP-SLR states that an applicant may take one or more exceptions to specific GALL-SLR Report AMP elements; however, any exception to the GALL-SLR Report AMP should be described and justified. Therefore, the staff considers exceptions as being portions of the GALL-SLR Report AMP that the applicant does not intend to implement.

(3) For all other items, other items, such as plant-specific AMPs and AMR items that do not correspond to items in the GALL-SLR Report, the staff conducted a technical review to determine if the findings in 10 CFR 54.29(a)(1) are met.

As part of its SLRA review, the staff conducted a regulatory audit from October 4, 2021, to February 25, 2022, in accordance with the audit plan dated September 24, 2021 (ML21245A305) and as detailed in the audit report dated July 7, 2022 (ML22188A086).

These audits and technical reviews were conducted to determine if the staff can make the findings of 10 CFR 54.29(a)(1) such that there is reasonable assurance that activities authorized by the subsequent renewed licenses will continue to be conducted in accordance with the current licensing basis (CLB); that is, if the applicant has taken or will be taking actions with respect to managing the effects of aging during the period of extended operation on the functionality of SCs that it has identified as requiring review under 10 CFR 54.21(a)(1).

3.0.2.1 Review of Aging Management Programs

For those AMPs that the applicant asserted are consistent with the GALL-SLR Report AMPs, the staff conducted either an audit or a technical review to confirm this assertion. For each AMP that has one or more deviations, the staff evaluated each deviation to determine whether it is acceptable and whether the AMP, as modified, could adequately manage the aging effect(s) for which it was credited. For AMPs that are not addressed in the GALL-SLR Report, the staff performed a full review to determine their adequacy. The staff evaluated the AMPs against the following 10 program elements defined in table A.1-1 of the SRP-SLR:

(1) "<u>scope of program</u>"— should include the specific SCs subject to an AMR for subsequent license renewal (SLR).

(2) "<u>preventive action</u>"— should prevent or mitigate aging degradation.

(3) "<u>parameters monitored or inspected</u>"— should be linked to the degradation of the particular SC-intended function(s).

(4) "<u>detection of aging effects</u>"— should occur before there is a loss of SC-intended function(s). This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency, sample size, data collection, and timing of new or one-time inspections to ensure timely detection of aging effects.

(5) "<u>detection of aging effects</u>"— should occur before there is a loss of SC-intended function(s). This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency, sample size, data collection, and timing of new or one-time inspections to ensure timely detection of aging effects.

(6) "<u>monitoring and trending</u>"— should provide predictability of the extent of degradation, as well as timely corrective or mitigative actions.

(7) "<u>acceptance criteria</u>"— these criteria, against which the need for corrective action will be evaluated, should ensure that the SC-intended function(s) are maintained under all CLB design conditions during the subsequent period of extended operation.

(8) "<u>corrective actions</u>"— should include root cause determination and prevention of recurrence and should be timely.

(9) "<u>confirmation process</u>"— should ensure that corrective actions have been completed and are effective.

(10) "<u>administrative controls</u>"— should provide for a formal review and approval.

(11) "<u>operating experience</u>" (OE)— should add the OE applicable to the AMP, including past corrective actions resulting in program enhancements or additional programs, to provide objective evidence to support the conclusion that the effects of aging will be adequately managed so that the SC-intended function(s) will be maintained during the subsequent period of extended operation. OE with existing programs should be discussed.

> In addition, the ongoing review of both plant-specific and industry OE, including relevant research and development, ensures that the AMP is effective in managing the aging effects for which it is credited. The AMP is either enhanced or new AMPs are developed, as appropriate, when it is determined through the evaluation of OE that the effects of aging may not be adequately managed.

Details of the staff's audit evaluation of program elements 1 through 6 and 10 are documented in the audit report and summarized in SE section 3.0.3.

The staff reviewed the applicant's quality assurance (QA) program and documented the evaluations in SE section 3.0.4. The staff's evaluation of the QA program included an assessment of the "corrective actions," "confirmation process," and "administrative controls" program elements (program elements 7, 8, and 9).

The staff reviewed the information on the "operating experience" program element (program element 10) and documented the evaluation in SE sections 3.0.3 and 3.0.5.

3.0.2.2 Review of AMR Results

Each SLRA table 2 contains information concerning whether the AMRs identified by the applicant align with the GALL-SLR Report AMRs. For a given AMR in a table 2, the staff reviewed the intended function, material, environment, aging effect requiring management (AERM), and AMP combination for a particular system component type. Item numbers in column seven, "NUREG-2191, Item," of each SLRA table 2 correlate to an AMR combination identified in the GALL-SLR Report. The staff also conducted a technical review of combinations not consistent with the GALL-SLR Report. Column eight, "Table 1 Item," refers to a number indicating the correlating row in table 1.

For component groups evaluated in the GALL-SLR Report for which the applicant claimed consistency and for which it does not recommend further evaluation, the staff determined, on the basis of the review, whether the plant-specific components of these GALL-SLR Report component groups were bounded by the GALL-SLR Report evaluation.

The applicant noted for each AMR item how the information in the tables aligns with the information in the GALL-SLR Report. The staff audited those AMRs with notes A through E, indicating how the AMR is consistent with the GALL-SLR Report.

Note A indicates that the AMR item is consistent with the GALL-SLR Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL-SLR Report AMP. The staff audited these items to verify consistency with the GALL-SLR Report and to confirm the validity of the AMR for the site-specific conditions. The staff also determined whether the applicant's AMP is consistent with the GALL-SLR Report AMP.

Note B indicates that the AMR item is consistent with the GALL-SLR Report for component, material, environment, and aging effect. Because the AMP takes one or more exceptions to the GALL-SLR Report AMP, the staff audited these items to verify consistency with the GALL-SLR Report and to confirm the validity of the AMR for the site-specific conditions. The staff also confirmed that it reviewed and accepted the identified exceptions to the GALL-SLR Report AMPs.

Note C indicates that the component for the AMR item is different than that in the GALL-SLR Report but that the item is otherwise consistent with the GALL-SLR Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL-SLR Report AMP. This note indicates that the applicant was unable to find an AMR item associated with the component in the GALL-SLR Report but found a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these items to verify consistency with the GALL-SLR Report and to confirm the validity of the AMR for the site-specific conditions. The staff also determined whether the AMR item of the different component is applicable to the component under review and whether the AMR is valid for the site-specific conditions. Finally, the staff determined whether the applicant's AMP is consistent with the GALL-SLR Report AMP.

Note D indicates that the component for the AMR item is different than that in the GALL-SLR Report but that the item is otherwise consistent with the GALL-SLR Report for material, environment, and aging effect. In addition, the AMP takes one or more exceptions to the GALL-SLR Report AMP. Like note C, this note indicates that the applicant was unable to find an AMR item associated with the component in the GALL-SLR Report but found a different component with the same material, environment, aging effect, and AMP as the component under review. Note D is used to indicate that the applicant has taken one or more exceptions to the GALL-SLR Report AMP. The staff audited these items to verify consistency with the GALL-SLR Report and to confirm the validity of the AMR for the site-specific conditions. The staff also determined whether the AMR item of the different component is applicable to the component under review and whether the AMR is valid for the site-specific conditions. Finally, the staff confirmed that it reviewed and accepted the identified exceptions to the GALL-SLR Report AMPs.

Note E indicates that the AMR item is consistent with the GALL-SLR Report for material, environment, and aging effect but that a different AMP is credited or the GALL-SLR Report identifies a plant-specific AMP. The staff audited these items to verify consistency with the GALL-SLR Report and to confirm the validity of the AMR for the site-specific conditions. The staff also determined whether the credited AMP would adequately manage the aging effect(s).

3.0.2.3 Updated Final Safety Analysis Report Supplement

Per 10 CFR 54.21(d), each application must include an updated final safety analysis report (UFSAR) supplement for the facility that contains a summary description of the programs and activities for managing the effects of aging and the evaluation of time-limited aging analyses (TLAAs) for the period of extended operation determined by the integrated plant assessment and the evaluation of TLAAs, respectively. Consistent with the SRP-SLR, the staff reviewed the UFSAR supplement.

3.0.2.4 Documentation and Documents Reviewed

In performing the review, the staff used the SLRA, SLRA supplements, SRP-SLR, GALL-SLR Report, and the applicant's responses to requests for additional information (RAIs).

During the regulatory audit, the staff examined the applicant's justifications, as documented in the audit report, to verify that the applicant's activities and programs are adequate to manage the effects of aging on SCs. The staff also conducted detailed discussions and interviews with the applicant's license renewal project personnel and others with technical expertise relevant to aging management.

3.0.3 Aging Management Programs

SE table 3.0-1 below presents the AMPs credited by the applicant and described in SLRA appendix B, "Aging Management Programs." The table also indicates (a) whether the AMP is an existing or new program, (b) the staff's final disposition of the AMP, (c) the GALL-SLR Report program to which the applicant's AMP was compared, and (d) the SE section that documents the staff's evaluation of the program.

Table 3.0-1 St. Lucie Aging Management Programs

St. Lucie Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in this Safety Evaluation
Fatigue Monitoring	19.2.1.1 B.2.2.1	Existing	Consistent with enhancements	X.M1 Fatigue Monitoring	3.0.3.2.1
Neutron Fluence Monitoring	19.2.1.2 B.2.2.2	Existing	Consistent with enhancements	X.M2 Neutron Fluence Monitoring	3.0.3.2.2
Environmental Qualification of Electric Equipment	19.2.1.3 B.2.2.3	Existing	Consistent with enhancements	X.E1 Environmental Qualification (EQ) of Electric Components	3.0.3.2.3
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	19.2.2.1 B.2.3.1	Existing	Consistent	XI.M1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	3.0.3.1.1
Water Chemistry	19.2.2.2 B.2.3.2	Existing	Consistent	XI.M2 Water Chemistry as modified by SLR-ISG-2021-02 MECHANICAL,	3.0.3.1.2
Reactor Head Closure Stud Bolting	19.2.2.3 B.2.3.3	Existing	Consistent with exception and enhancement	XI.M3 Reactor Head Closure Stud Bolting	3.0.3.2.4
Boric Acid Corrosion	19.2.2.4 B.2.3.4	Existing	Consistent with enhancement	XI.M10 Boric Acid Corrosion	3.0.3.2.5
Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	19.2.2.5 B.2.3.5	Existing	Consistent with enhancement	XI.M11B Cracking of Nickel-Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs Only)	3.0.3.2.6
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel	16.2.2.6 B.2.3.6	Existing	Consistent	XI.M12 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS), as modified by SLR-ISG-2021-02-Mechanical,	3.0.3.2.7

St. Lucie Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in this Safety Evaluation
Reactor Vessel Internals	19.2.2.7 B.2.3.7	Existing	Consistent with enhancements	XI.M16A PWR Vessel Internals, as modified by SLR-ISG-2021-01-PWRVI	3.0.3.2.8
Flow-Accelerated Corrosion	19.2.2.8 B.2.3.8	Existing	Consistent with enhancements	XI.M17 Flow-Accelerated Corrosion	3.0.3.2.9
Bolting Integrity	19.2.2.9 B.2.3.9	Existing	Consistent with enhancements	XI.M18 Bolting Integrity	3.0.3.2.10
Steam Generators	19.2.2.10 B.2.3.10	Existing	Consistent	XI.M19 Steam Generators	3.0.3.1.3
Open-Cycle Cooling Water System	19.2.2.11 B.2.3.11	Existing	Consistent with enhancements	XI.M20 Open-Cycle Cooling Water System	3.0.3.2.11
Closed Treated Water Systems	19.2.2.12 B.2.3.12	Existing	Consistent with enhancements	XI.M21A Closed Treated Water Systems, as modified by SLR-ISG-2021-02-MECHANICAL	3.0.3.2.12
Inspection of Overhead Heavy Load Handling Systems	19.2.2.13 B.2.3.13	Existing	Consistent with enhancements	XI.M23 Inspection of Overhead Heavy Load and Light Load Handling Related to Refueling) Handling Systems, as modified by SLR-ISG-2021-02-MECHANICAL	3.0.3.2.13
Compressed Air Monitoring	19.2.2.14 B.2.3.14	Existing	Consistent with enhancements	XI.M24 Compressed Air Monitoring	3.0.3.2.14
Fire Protection	19.2.2.15 B.2.3.15	Existing	Consistent with enhancements	XI.M26 Fire Protection	3.0.3.2.15
Fire Water System	16.2.2.16 B.2.3.16	Existing	Consistent with enhancements	XI.M27 Fire Water System	3.0.3.2.16
Outdoor and Large Atmospheric Metallic Storage Tanks	19.2.2.17 B.2.3.17	Existing	Consistent with exceptions and enhancements	XI.M29 Outdoor and Large Atmospheric Metallic Storage Tanks	3.0.3.2.17
Fuel Oil Chemistry	19.2.2.18 B.2.3.18	Existing	Consistent with exception and enhancements	XI.M30 Fuel Oil Chemistry	3.0.3.2.18
Reactor Vessel Material Surveillance	19.2.2.19 B.2.3.19	Existing	Consistent with exceptions	XI.M31 Reactor Vessel Material Surveillance	3.0.3.2.19
One-Time Inspection	16.2.2.20 B.2.3.20	New	Consistent	XI.M32 One-Time Inspection	3.0.3.1.4
Selective Leaching	19.2.2.21 B.2.3.21	New	Consistent	XI.M33 Selective Leaching	3.0.3.1.5
ASME Code Class 1 Small-Bore Piping	19.2.2.22 B.2.3.22	Existing	Consistent	XI.M35 ASME Code Class 1 Small-Bore-Piping	3.0.3.1.6

St. Lucie Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in this Safety Evaluation
External Surfaces Monitoring of Mechanical Components	19.2.2.23 B.2.3.23	Existing	Consistent with enhancements	XI.M36 External Surfaces Monitoring of Mechanical Components	3.0.3.2.20
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	16.2.2.24 B.2.3.24	New	Consistent	XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	3.0.3.1.7
Lubricating Oil Analysis	19.2.2.25 B.2.3.25	Existing	Consistent with enhancements	XI.M39 Lubricating Oil Analysis	3.0.3.2.21
Monitoring of Neutron-Absorbing Materials Other Than Boraflex	19.2.2.26 B.2.3.26	Existing	Consistent with enhancements	XI.M40, “Monitoring of Neutron-Absorbing Materials Other Than Boraflex”	3.0.3.2.22
Buried and Underground Piping and Tanks	19.2.2.27 B.2.3.27	New	Consistent	XI.M41 Buried and Underground Piping and Tanks	3.0.3.2.23
Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	19.2.2.28 B.2.3.28	New	Consistent	XI.M42 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks, as modified by SLR-ISG-2021-02-MECHANICAL	3.0.3.1.8
ASME Section XI, Subsection IWE	19.2.2.29 B.2.3.29	Existing	Consistent with enhancements	XI.S1 ASME Section XI, Subsection IWE Inservice Inspection	3.0.3.2.24
ASME Section XI, Subsection IWF	19.2.2.30 B.2.3.30	Existing	Consistent with exception and enhancements	XI.S2 ASME Section XI, Subsection IWF Inservice Inspection	3.0.3.2.25
10 CFR Part 50, Appendix J	19.2.2.31 B.2.3.31	Existing	Consistent	XI.S4 10 CFR Part 50, Appendix J	3.0.3.1.9
Masonry Walls	19.2.2.32 B.2.3.32	Existing	Consistent with enhancements	XI.S5 Masonry Walls	3.0.3.2.26
Structures Monitoring	19.2.2.33 B.2.3.33	Existing	Consistent with exception and enhancements	XI.S6 Structures Monitoring	3.0.3.2.27
Inspection of Water-Control Structures Associated with Nuclear Power Plants	19.2.2.34 B.2.3.35	Existing	Consistent with enhancements	XI.S7 Inspection of Water-Control Structures Associated with Nuclear Power Plants	3.0.3.2.28

St. Lucie Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in this Safety Evaluation
Protective Coating Monitoring and Maintenance	19.2.2.35 B.2.3.35	Existing	Consistent with enhancement	XI.S8 Protective Coating Monitoring and Maintenance, as modified by SLR-ISG-2021-03-STRUCTURES	3.0.3.2.29
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	19.2.2.36 B.2.3.36	Existing	Consistent with enhancements	XI.E1 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.2.30
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements used in Instrumentation Circuits	19.2.2.37 B.2.3.37	New	Consistent	XI.E2 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	3.0.3.2.31
Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	19.2.2.38 B.2.3.38	Existing	Consistent	XI.E3A Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements, as modified by SLR-ISG-2021-04-ELECTRICAL	3.0.3.1.10
Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	16.2.2.39 B.2.3.39	New	Consistent	XI.E3B Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements, as modified by SLR-ISG-2021-04-ELECTRICAL	3.0.3.1.11

St. Lucie Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in this Safety Evaluation
Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	19.2.2.40 B.2.3.40	New	Consistent	XI.E3C Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements, as modified by SLR-ISG-2021-04-ELECTRICAL	3.0.3.1.12
Metal Enclosed Bus	19.2.2.41 B.2.3.41	New	Consistent	XI.E4 Metal Enclosed Bus	3.0.3.1.13
Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	16.2.2.43 B.2.3.43	New	Consistent	XI.E6 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.14
High-Voltage Insulators	19.2.2.43 B.2.3.43	New	Consistent	XI.E7 High-Voltage Insulators New AMP, as modified by SLR-ISG-2021-04-ELECTRICAL	3.0.3.1.15
Pressurizer Surge Line	19.2.2.44	Existing	Plant-specific	N/A	3.0.3.3.1

3.0.3.1 AMPs Consistent with the GALL-SLR Report

In SLRA appendix B, the applicant identified the following AMPs as consistent with the GALL-SLR Report:

- American Society of Mechanical Engineers (ASME) section XI, “Inservice Inspection,” Subsections IWB, IWC, and IWD
- Water chemistry
- Steam generators
- One-time inspection
- Selective leaching
- ASME code class 1 small-bore piping
- Inspection of internal surfaces in miscellaneous piping and ducting components
- Internal coatings/linings for in-scope piping, piping components, heat exchangers, and tanks
- 10 CFR Part 50, appendix J

- Electrical insulation for electrical cables and connections not subject to 10 CFR 50.49 environmental qualification requirements used in instrumentation circuits
- Electrical insulation for inaccessible medium-voltage power cables not subject to 10 CFR 50.49 environmental qualification requirements
- Electrical insulation for inaccessible instrument and control cables not subject to 10 CFR 50.49 environmental qualification requirements
- Electrical insulation for inaccessible low-voltage power cables not subject to 10 CFR 50.49 environmental qualification requirements
- Metal enclosed bus
- Electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements
- High-voltage insulators
- Pressurizer surge line

In the following sections, the staff discusses the results of the evaluation for these AMPs, listing any amendments to the programs during the review, a summary of the staff's determination of consistency, any RAIs and applicant responses, OE, and a review of the applicant's UFSAR supplement summary of the program.

3.0.3.1.1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

SLRA section B.2.3.1 describes the existing ASME section XI, "Inservice Inspection," subsections IWB, IWC, and IWD program as consistent with GALL-SLR Report AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD." The applicant amended this SLRA section by letter dated April 7 (ML22097A202).

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M1.

The staff conducted an audit to verify applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M1. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA section B.2.3.1 summarizes OE related to the ASME section XI, "Inservice Inspection," Subsections IWB, IWC, and IWD program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff conducted an independent search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMP to manage the effects of aging in the subsequent period of extended operation.

Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the ASME section XI "Inservice Inspection," Subsections IWB, IWC, and IWD program was evaluated.

UFSAR Supplement. SLRA appendix A1, section 19.2.2.1, and appendix A2, section 19.2.2.1, provide the UFSAR supplement for the ASME section XI "Inservice Inspection," Subsections IWB, IWC, and IWD program for St. Lucie Units 1 and 2, respectively. The staff reviewed the UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report table XI-01. The staff also noted that the applicant committed to continue implementation of the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program during the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on the review of applicant's ASME section XI Inservice Inspection, subsections IWB, IWC, and IWD program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.2 Water Chemistry

SLRA section B2.3.2 describes the existing Water Chemistry program as consistent with GALL-SLR Report AMP XI.M2, "Water Chemistry," as modified by SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance."

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M2, as modified by SLR-ISG-2021-02-MECHANICAL (ML20181A434).

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria" and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M2, as modified by SLR-ISG-2021-02-MECHANICAL (ML20181A434).

Operating Experience. SLRA Section B2.3.2 summarizes OE related to the water chemistry program. The staff reviewed OE information in the application. As discussed in the audit report (ML22188A086), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the water chemistry program was evaluated.

UFSAR Supplement. SLRA appendix A1, section 19.2.2.2 and appendix A2, section 19.2.2.2 provide the UFSAR supplement for the water chemistry program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report table XI-01. The staff also noted that the applicant committed to ongoing implementation of the water chemistry program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on the review of the applicant's water chemistry program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the final safety analysis report (FSAR) supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.3 Steam Generators

SLRA section B.2.3.10 states that the steam generators program is an existing program that is consistent with the program elements in the GALL-SLR Report AMP XI.M19, "Steam Generators." The applicant amended this SLRA section by letters dated July 11, 2022, and August 9, 2022 (ML22192A078 and ML22221A134). The letter dated August 9, 2022, stated, "This revised SLRA supplemental response supersedes in its entirety the supplemental response provided in Attachment 18 of the applicant's Letter L-2022-043 (ML22097A202)."

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M19.

The "scope of the program" and "parameters monitored or inspected" program elements, as modified by responses to RAIs B.2.3.10-2, B.2.3.10-3, and B.2.3.10-4 (ML22192A078), are acceptable as follows. SLRA section B.2.3.10 was revised to clarify that the accessible portions of the St. Lucie Unit 1 feedring and its supports are visually inspected at least twice each steam generator inspection interval (every outage in which steam generator eddy current inspections are performed). PSL further clarified that the St. Lucie Unit 2 feedring and its supports are visually inspected every outage in which steam generator eddy current inspections are performed and when water-hammer monitoring criteria are met during the prior operating cycle. SLRA section B.2.3.10 was revised to remove instances related to steam generator tube repair because St. Lucie is not approved for alternative repair criteria or alternate repair methods. SLRA Table 2.3.1-5 was revised by adding a note to clarify that component type anti-vibration bars includes the St. Lucie Unit 1 flat fan bars and the St. Lucie Unit 2 v-shaped support pads.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, amendments, and the applicant's responses to RAIs B.2.3.10-2, B.2.3.10-3, and B.2.3.10-4, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M19.

Operating Experience. SLRA section B.2.3.10 summarizes OE related to the steam generators program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff reviewed search results of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the steam generators program was evaluated.

UFSAR Supplement. SLRA appendix A1, section 19.2.2.10 and appendix A2, section 19.2.2.10,as amended by letter dated August 9, 2022 (ML22221A134), provide the UFSAR supplements for the steam generators program. The staff reviewed the UFSAR supplement descriptions of the program, as amended, and noted that they are consistent with the recommended description in GALL-SLR Report table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing steam generators program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the UFSAR supplements provides adequate summary descriptions of the program.

Conclusion. Based on the review of the applicant's steam generators program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplements for this AMP and concludes that they provide an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.4 One-Time Inspection

SLRA section B.2.3.20 describes the new one-time inspection program as consistent with GALL-SLR Report AMP XI.M32, "One-Time Inspection."

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M32.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria" and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M32.

Operating Experience. SLRA section B.2.3.20 summarizes OE related to the one-time inspection program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff reviewed search results of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program.

As noted in its response to RAI B.2.3.23-2 (letter dated April 21, 2023, ML23111A129), concerning a recent failure of a PSL emergency diesel generator radiator tube, the applicant determined that external visual examinations of the radiator tubes for loss of material and cracking did not appear to be feasible. Consequently, the applicant chose to volumetrically examine the Unit 2 copper alloy with greater than 15 percent zinc radiator tubes for loss of material and cracking with the one-time inspection program. The staff's evaluation of the applicant's proposal to use the one-time inspection program to manage the cited aging effects is documented in SE sections 3.3.2.1.1 and 3.3.2.3.1

UFSAR Supplement. SLRA appendix A1, section 19.2.2.20 and appendix A2, section 19.2.2.20 provide the UFSAR supplement for the one time inspection program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report table XI-01. The staff also noted the applicant committed to implement the new one-time inspection program no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The applicant also committed to implement the AMP and start the one-time and 10-year interval inspections no earlier than 10 years prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff further noted that the applicant revised the Unit 2 UFSAR supplement (appendix A2, section 19.2.2.20) and the associated commitment in its response to RAI B.2.3.23-2 by adding the volumetric examinations of the Unit 2 emergency diesel generator radiator tubes to manage aging effects of loss of material and cracking. The staff finds that the information in the UFSAR supplements, as amended by letter dated April 21, 2023, is an adequate summary description of the program.

Conclusion. Based on the review of the applicant's one-time inspection program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d)

3.0.3.1.5 Selection Leaching

SLRA section B.2.3.21 describes the new selective leaching program as consistent with GALL-SLR Report AMP XI.M33, “Selective Leaching.” The applicant amended this SLRA section by letter dated April 7, 2022 (ML22097A202) and April 21, 2023 (ML23111A129).

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.M33.

The “detection of aging effects” program element, as modified by responses to RAIs B.2.3.21-1 and B.2.3.212 (ML22164A802), is acceptable for the following reasons: (a) backfill quality and external coatings for buried gray cast iron fire protection system piping are consistent with the “preventive actions” program element of GALL-SLR Report AMP XI.M41, “Buried and Underground Piping and Tanks,” which minimizes the potential for selective leaching on the external surfaces of the subject piping; (b) although the applicant’s review of plant-specific OE identified a failure of buried gray cast iron fire protection system piping, selective leaching was not a significant contributor to this failure; (c) the staff’s review of OE during the audit did not identify any instances of significant selective leaching of buried gray cast iron fire protection system piping; (d) based on the review of results from seven soil corrosivity samples provided by the applicant in its response to RAI B.2.3.21-2, the staff noted that soil can be considered noncorrosive (using average values) to cast iron when scoring in accordance with table A.1, “Soil Test Evaluation,” of AWWA C105, “Polyethylene Encasement for Ductile-Iron Pipe Systems;” and (e) based on the review of the results from seven soil corrosivity samples provided by the applicant, the staff finds that the soil environment is consistent between both units.

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA (as amended) and the applicant’s responses to RAIs B.2.3.21-1 and B.2.3.21-2, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M33.

Operating Experience. SLRA section B.2.3.21 summarizes OE related to the selective leaching program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086) the staff reviewed plant OE information provided by the applicant to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the subsequent period of extended operation.

After completing the audit in February 2022, the staff subsequently identified relevant site-specific OE involving a loss of intended function of an emergency diesel generator (EDG) due to a radiator leak that occurred in June 2022. The applicant’s failure analysis determined that the cause of the leak was dezincification (i.e., selective leaching) on the external surfaces of the Unit 1 yellow brass (copper alloy with greater than 15 percent zinc) EDG radiator tubes exposed to an uncontrolled indoor air environment. Based on the EDG’s consequent loss of intended function and this never-seen-before aging mechanism in an air environment, the staff determined the need for additional information regarding the event. The staff sought information regarding the need to manage loss of material due to selective leaching for in-scope copper alloy with greater than 15 percent zinc components exposed to uncontrolled indoor air and more aggressive air environments (i.e., air-outdoor and condensation). The staff's associated request and the applicant's response are documented in FSL's letter dated April 21, 2023. The response to RAI B.2.3.21-3 states the following (in part):

- "[t]he combination of damp conditions [from periodic rinsing], elevated temperature during operation, and accumulation of corrosive deposits on the tube OD [outer diameter] surface accelerated corrosion of the fan side fin and tubes…[t]he yellow brass tubes contained more than 15 percent zinc and were susceptible to selective leaching of the zinc…"

- "[t]here are significant differences between the Unit 1 and 2 EDG radiator designs."

- "[u]nlike the Unit 1 radiators, PSL copper alloy with greater than 15 percent zinc components within the scope of license renewal that are located indoors in Class 1 structures, including the Unit 2 EDG radiators, are not exposed to periodic wetting."

- "[i]t is reasonable to conclude that the [June] 2022 failure of the 1B2 EDG radiator tube due to loss of material due to selective leaching is an aging effect unique to the external surfaces of the Unit 1 EDG radiators that are exposed to an air-indoor uncontrolled environment."

The staff finds the response to RAI B.2.3.21-3 (and modifications to SLRA tables 3.3.2-4, 3.3.2-5, 3.3.2-7, 3.3.2-8, and 3.4.2-1; SLRA appendices A1 and A2; and SLRA section B.2.3.21) acceptable for each environment as follows:

Air-Indoor Uncontrolled. The staff finds that the Unit 1 environment described in the response to RAI B.2.3.21-3 (i.e., damp conditions from periodic rinsing, elevated temperature during operation, accumulation of corrosive deposits) is more aggressive than the uncontrolled indoor air environment to which other copper alloy with greater than 15 percent zinc components are exposed (i.e., normally dry, limited accumulation of corrosive deposits, protected from weather). In Commitment 24, the applicant intends to perform a one-time inspection of a representative sample of the Unit 2 EDG admiralty brass radiator tubes exposed to uncontrolled indoor air to confirm that selective leaching is an aging effect unique to the Unit 1 EDG radiator tubes. The staff notes that, as discussed in SE section 2.3.2, the Unit 1 EDG radiators have been periodically replaced since 2001 and, therefore, are not long-lived components subject to an AMR. Based on the less aggressive environment, the staff finds that the applicant has provided a reasonable basis for why copper alloy with greater than 15 percent zinc components exposed to uncontrolled indoor air do not need to be managed for loss of material due to selective leaching.

Air-Outdoor. The applicant revised the SLRA to reflect that one-time inspections of a representative sample of Units 1 and 2 copper alloy with greater than 15 percent zinc components exposed to outdoor air would be performed prior to the subsequent period of extended operation. Although the applicant stated loss of material due to selective leaching in an air environment is an aging effect unique to the external surfaces of the Unit 1 EDG radiators, the staff noted that the environment described in the response to RAI B.2.3.21-3 has similarities to the GALL-SLR Report table IX.D, “Use of Terms for Environments,” definition of air-outdoor (e.g., exposure to precipitation and salt-laden air). For instances where an aging effect is not expected to occur, but the data are insufficient to rule it out with reasonable confidence, the staff noted the GALL-SLR Report recommends the use of one-time inspections. The staff finds the applicant’s approach to perform one-time inspections, in lieu of periodic inspections, of copper alloy with greater than 15 percent zinc components exposed to outdoor air to be reasonable because although dezincification is not expected to occur for these components, the staff does not have a sufficient basis to rule it out with reasonable confidence (based on the similarities between the environment described in the response to RAI B.2.3.21-3 and the GALL-SLR Report definition of air-outdoor).

Condensation. Based on the staff’s review of the SLRA, there are no in-scope copper alloy with greater than 15 percent zinc components exposed to condensation.

Based on the applicant’s response to RAI B.2.3.21-3, the staff finds that the conditions and OE at the plant are not bounded by those for which the GALL-SLR Report AMP (i.e., selective leaching program) was evaluated. As discussed above, the applicant has appropriately augmented the program to address the impact of the plant-specific OE, as prescribed in the GALL-SLR Report for crediting a corresponding GALL-SLR Report AMP.

UFSAR Supplement. SLRA appendix A1, section 19.2.2.21 and appendix A2, section 19.2.2.21 provide the UFSAR supplement for the selective leaching program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report table XI-01. The staff also noted the applicant committed to the following: (a) implement the new selective leaching program no later than 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components; (b) begin program inspections 10 years before the subsequent period of extended operation; and (c) complete the one-time and first 10-year interval inspections 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on the review of the applicant’s selective leaching program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.6 ASME Code Class 1 Small-Bore Piping

SLRA section B.2.3.22 states that the ASME Code Class 1 small-bore piping is an existing program that will be consistent with the program elements in the GALL-SLR Report AMP XI.M35, “ASME Code Class 1 Small-Bore Piping.”

Staff Evaluation. During the audit (ML22188A086), the staff reviewed PSL’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.M35.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M35. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA section B.2.3.22 summarizes OE related to the ASME Code Class1 small-bore piping program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis on the ability of the applicant's proposed AMP to manage the effects of aging during the subsequent period of extended operation. The staff did not identify any OE indicating that PSL should modify its proposed program.

The staff noted that, since 2012, FPL has performed 8 inspections for Unit 1 and 10 inspections for Unit 2 on Class 1 small-bore piping selected for the initial license renewal. These inspections showed that no unacceptable indications were identified and that no evidence of service-induced flaws were found.

Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the ASME Code Class 1 small-bore piping program was evaluated.

UFSAR Supplement. SLRA appendix A1, section 19.2.2.22 and appendix A2, section 19.2.2.22 provide the UFSAR supplement for the ASME Code Class 1 small-bore piping program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report, table XI-35. The staff also noted that PSL committed to implementing the updated ASME Code Class 1 small-bore piping program within 6 years prior to the start of the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on the review of PSL's ASME Code Class 1 small-bore piping program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.7 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

SLRA section B.2.3.24 describes the new inspection of internal surfaces in miscellaneous piping and ducting components program as consistent with GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components."

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M38.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria" and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M38.

Operating Experience. SLRA section B.2.3.24 summarizes OE related to the inspection of internal surfaces in miscellaneous piping and ducting components program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff reviewed plant OE information provided by the applicant to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation.

The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the inspection of internal surfaces in miscellaneous piping and ducting components program was evaluated.

UFSAR Supplement. SLRA appendix A1, section 19.2.2.24 and appendix A2, section 19.2.2.24 provide the UFSAR supplement for the inspection of internal surfaces in miscellaneous piping and ducting components program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report table XI01. The staff also noted the applicant committed to implement the new inspection of internal surfaces in miscellaneous piping and ducting components program no later than 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on the review of the applicant's internal surfaces in miscellaneous piping and ducting components program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.8 Buried and Underground Piping and Tanks

SLRA section B.2.3.27 describes the new buried and underground piping and tanks program as consistent with GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," except for the exception identified in the SLRA (the exception was added by letter dated September 8, 2022 (ML22251A202) in response to RAI B.2.3.27-1a). The applicant amended this SLRA section by letters dated April 7, 2022 (ML22097A202) and September 8, 2022 (ML22251A202).

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M41.

The staff finds that the "preventive actions" program element, as modified by response to RAIB.2.3.27-1 (ML22164A802), is acceptable because it is consistent with GALL-SLR Report AMP XI.M41 recommendations: (a) buried metallic piping (excluding a portion of buried stainless steel (SS) piping, which the staff addresses in the exception below) is either concrete encased or externally coated with epoxy, coal tar epoxy, or fusion bonded epoxy; (b) portions of buried fire protection system piping (not covered by [a] above) are externally coated in accordance with NFPA 24, "Standard for the Installation of Private Fire Service Mains and Their Appurtenances;" and (c) underground steel piping is externally coated with zinc or coal tar epoxy.

The staff also reviewed the portions of the "preventive actions" program element associated with the exception to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of this exception follows.

Exception 1. As amended by letter dated September 8, 2022 (ML22251A202), SLRA section B.2.3.27 includes an exception to the "preventive actions" program element related to buried SS piping buried beneath the Unit 1 turbine building, which could not be confirmed as externally coated. The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M41 and finds it acceptable as follows. In its response to RAI B.2.3.212 (ML22164A802), the applicant provided results from soil corrosivity testing conducted between 2011 and 2014. The applicant clarified (in its response to RAI B.2.3.27-1a) that the soil sample in which detectable levels of chlorides and sulfates were measured was near the intake cooling water piping on the intake side of the plant where saltwater intrusion had occurred and was not located near the subject uncoated SS piping. Based on the review of the soil corrosivity testing data (excluding the outlier soil sample noted above), the staff noted that soil can be considered moderately corrosive (the second least aggressive out of four categories) to SS when scoring in accordance with Table 9-4, "Soil Corrosivity Index from BPWORKS," of Electric Power Research Institute (EPRI) Report 3002005294, "Soil Sampling and Testing Methods to Evaluate the Corrosivity of the Environment for Buried Piping and Tanks at Nuclear Power Plants."

In addition, as noted in the third supplement to NUREG-1930, "Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3," soil is considered aggressive for uncoated SS when soil resistivity is less than 1,000 ohm-cm, pH is less than 4.5, and chlorides are more than 500 parts per million.[1] The staff noted the measured values of soil resistivity, pH, and chlorides were within these limits, confirming that the soil is nonaggressive for uncoated SS. Furthermore, the staff did not identify instances of age-related degradation in buried SS piping during the audit. Based on the nonaggressive environment and acceptable OE, the staff finds that two inspections of buried SS piping in each 10-year period (consistent with GALL-SLR Report Table XI.M412, "Inspection of Buried and Underground

[1] Corrosion Resistance of Stainless Steels in Soils and in Concrete (paper presented at the Plenary Days of the Committee on the Study of Pipe Corrosion and Protection), Biarritz, France, October 2001, Pierre-Jean Cunat.

Piping and Tanks”) provides reasonable assurance that the effects of aging will be adequately managed during the SPEO.

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA (as amended), and the applicant’s responses to RAIs B.2.3.27-1, B.2.3.27-2, and B.2.3.21-2, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M41. The staff also reviewed the exception between the applicant’s program and GALL-SLR Report XI.M41 associated with the “preventive actions” program element, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects.

Operating Experience. SLRA section B.2.3.27 summarizes OE related to the buried and underground piping and tanks program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff reviewed plant OE information provided by the applicant to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the subsequent period of extended operation.

The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the buried and underground piping and tanks program was evaluated.

UFSAR Supplement. SLRA appendix A1, section 19.2.2.27 and appendix A2, section 19.2.2.27 provide the UFSAR supplement for the buried and underground piping and tanks program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted the applicant committed to the following: (a) implement the new buried and underground piping and tanks program no later than six months prior to the subsequent period of extended operation for managing the effects of aging for applicable components; (b) install cathodic protection systems at least 10 years before the subsequent period of extended operation; (c) begin program inspections 10 years before the subsequent period of extended operation; and (d) complete the first 10-year interval inspections six months prior to the SPEO or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on the review of the applicant’s buried and underground piping and tanks program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the exception, and finds that with the exception implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.9 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks

SLRA section B.2.3.28 describes the new internal coatings/linings for in-scope piping, piping components, heat exchangers, and tanks program as consistent with GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," as modified by SLR-ISG-2021-02-MECHANICAL (ML20181A434), "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance." The applicant amended this SLRA section by letter dated April 7, 2022 (ML22097A202).

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M42, as modified by SLR-ISG-2021-02-MECHANICAL (ML20181A434).

For the "detection of aging effects" program element, the staff determined the need for additional information related to inspections for buried concrete-lined fire protection piping. Specifically, the staff noted the following during the review:

- GALL-SLR Report AMP XI.M42, as modified by SLR-ISG-2021-02-MECHANICAL (ML20181A434), states opportunistic inspections, in lieu of periodic inspections, are an acceptable alternative for buried internally lined/coated fire water system piping provided certain conditions are met. One of these conditions is that plant-specific OE is acceptable (i.e., no leaks due to age-related degradation of *representative* [emphasis added by staff] internal coatings/linings used in buried in-scope fire water system components).

- SLRA section B.2.3.27, "Buried and Underground Piping and Tanks," describes plant-specific OE where intake cooling water system piping experienced through-wall degradation due to the damage to the cement liner.

Based on the OE noted above, the staff determined the need for additional information with respect to how the condition of concrete-lined piping in the intake cooling water system (where leaks occurred due to degradation of the cement liner) is not representative of the condition of concrete-lined piping in the fire protection system. The applicant provided a supplemental response (ML22097A202), which revised SLRA section B.2.3.28 to state the following:

> The fire water system is supplied by the CWSTs [City Water Storage Tanks], which are supplied by potable water from the Fort Pierce water supply line to the site. Although this is considered a raw water environment, it represents a significantly more benign environment for the aging effects of concern when compared with the other raw water source (brackish water at the intake structure) used at the PSL. Additionally, the flow rate through the fire water system is much lower than that through the intake cooling water system or the circulating water system. Because of the milder environment, lower flow rates, and because plant-specific OE does not show any leaks due to age-related degradation of the internally coated/lined portions of the fire water system, opportunistic inspections,

in lieu of periodic inspections, will be performed for the buried concrete lined fire protection piping.

Based on the supplemental response, the staff finds that the OE noted by the staff is not representative of the condition of concrete-lined piping in the fire protection system. Therefore, the staff's concern associated with performing opportunistic inspections for buried concrete-lined fire protection piping is resolved.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA (as amended by letter dated April 7, 2022), the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria" and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M42, as modified by SLR-ISG-2021-02-MECHANICAL (ML20181A434).

Operating Experience. SLRA section B.2.3.28 summarizes OE related to the internal coatings/linings for in-scope piping, piping components, heat exchangers, and tanks program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff reviewed plant OE information provided by the applicant to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation.

The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the audit and review of the application and the supplemental information provided by the applicant, the staff finds that the conditions and OE at the plant are bounded by those for which the internal coatings/linings for in-scope piping, piping components, heat exchangers, and tanks program was evaluated.

UFSAR Supplement. SLRA appendix A1, section 19.2.2.28 and appendix A2, section 19.2.2.28 provide the UFSAR supplement for internal coatings/linings for in-scope piping, piping components, heat exchangers, and tanks program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report table XI-01. The staff also noted the applicant committed to the following: (a) implement the new internal coatings/linings for in-scope piping, piping components, heat exchangers, and tanks program no later than 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components; (b) begin program inspections 10 years before the subsequent period of extended operation; and (c) complete baseline inspections 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on the review of the applicant's internal coatings/linings for in-scope piping, piping components, heat exchangers, and tanks program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.10 10 CFR Part 50, Appendix J

SLRA section B.2.3.31 describes the existing 10 CFR part 50, appendix J program as consistent with GALL-SLR Report AMP XI.S4, “10 CFR Part 50, Appendix J.”

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the applicant’s program in the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.S4.

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, and information provided during the audit, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria” and “corrective actions” program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.S4.

Operating Experience. SLRA section B.2.3.31 summarizes OE related to the 10 CFR part 50, appendix J program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff conducted an independent search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the subsequent period of extended operation.

The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the “10 CFR Part 50, Appendix J” program was evaluated.

UFSAR Supplement. SLRA appendix A1, section 19.2.2.31 and appendix A2, section 19.2.2.31 provide the UFSAR supplement for the 10 CFR part 50, appendix J program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report table XI-01. The staff noted that the applicant committed to ongoing implementation of the existing 10 CFR part 50, appendix J program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the program by no later than 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on the review of the applicant’s 10 CFR part 50, appendix J program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.11 Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirement

SLRA section B.2.3.38 describes the new electrical insulation for inaccessible medium-voltage power cables not subject to 10 CFR 50.49 environmental qualification requirements program as consistent with GALL-SLR Report AMP XI.E3A, "Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements," as modified by NRC SLR-ISG-2021-04-ELECTRICAL (ML20181A395), "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance." The applicant amended this SLRA section by letters dated April 7, 2022 (ML22097A202) (Supplement 1) and May 19, 2022 (ML22139A083) (Supplement 3).

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report as modified by NRC SLR-ISG-2021-04-ELECTRICAL. The staff compared the "scope of program," "preventive actions," "parameters monitored/inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL (ML20181A395).

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report, as modified by SLR-ISG-2021-04-ELECTRICAL. During the review of the SLRA and audit documents provided by the applicant, the staff found that section B.2.3.38 was not consistent with SLR-ISG-2021-04-ELECTRICAL (ML20181A395) (e.g., the applicant did not include "'potentially' exposed to wetting or submergence"). In addition, the staff found that the applicant did not incorporate all the modifications described within appendix A of SLR-ISG-2021-04-ELECTRICAL (ML20181A395). Therefore, during the audit, the staff requested that applicant explain why updates provided within SLR-ISG-2021-04-ELECTRICAL (ML20181A395) were not incorporated into section B.2.3.38 and section 19.2.2.38 of SRLA appendix A1, "Unit 1 Updated Final Safety Analysis Report Supplement," and appendix A2, "Unit 2 Updated Final Safety Analysis Report Supplement." In response to the staff's request, the applicant revised section B.2.3.38 via Supplement 1, and section 19.2.2.38 in appendices A1 and A2, via Supplement 3. Based on a review of the SLRA and amendments, the staff finds that the "scope of program," "preventive actions," "parameters monitored/inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL–SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL (ML20181A395).

Operating Experience. SLRA section B.2.3.38 summarizes OE related to the electrical insulation for inaccessible medium-voltage power cables not subject to 10 CFR 50.49 environmental qualification requirements program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff conducted an independent review of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the electrical insulation for inaccessible medium-voltage power cables not subject to 10 CFR 50.49 environmental qualification requirements program was evaluated.

UFSAR Supplement. SLRA appendix A1, section 19.2.2.38 and appendix A2, section 19.2.2.38 provide the UFSAR supplements for the electrical insulation for inaccessible medium-voltage power cables not subject to 10 CFR 50.49 environmental qualification requirements program. The staff reviewed the UFSAR Supplement descriptions of the program and noted that it is consistent with the recommended description in GALL–SLR Report table XI-01, as modified by SLR-ISG-2021-04-ELECTRICAL (ML20181A395). The staff also noted that the applicant committed to implement the program 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the UFSAR supplements is an adequate summary description of the program.

Conclusion. Based on the review of the applicant's electrical insulation for inaccessible medium-voltage power cables not subject to 10 CFR 50.49 environmental qualification requirements program, as amended, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report, as modified by SLR-ISG-2021-04-ELECTRICAL, are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplements for this AMP and concludes that they provide an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.12 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements used in Instrumentation Circuits

SLRA section B.2.3.37 stated that the electrical insulation for electrical cables and connections not subject to 10 CFR 50.49 environmental qualification requirements program is a new program with no enhancements that will be consistent without exception to the ten elements of the GALL-SLR Report AMP (NUREG-2191) XI.E2, "Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements used in Instrumentation Circuits."

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.E2.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E2.

Operating Experience. SLRA section B.2.3.37 summarizes OE related to the electrical insulation for electrical cables and connections not subject to 10 CFR 50.49 environmental qualification requirements used in instrumentation circuits program. It also states that PSL evaluates industry OE and takes appropriate corrective actions. Industry OE has identified that a change in temperature across a high-range radiation monitor cable in containment resulted in a substantial change in the reading of the monitor. Changes in instrument calibration can be caused by degradation of the electrical cable.

As discussed in the audit report (ML22188A086), the staff reviewed the applicant's corrective action program database provided by the applicant to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the electrical insulation for electrical cables and connections not subject to 10 CFR 50.49 environmental qualification requirements used in instrumentation circuits program was evaluated.

UFSAR Supplement. Section 19.2.2.37 of appendices A1 and A2 of the SLRA provide the UFSAR supplement for the electrical insulation for electrical cables and connections not subject to 10 CFR 50.49 environmental qualification requirements used in instrumentation circuits program. The staff reviewed these FSAR supplement descriptions of the program and noted that they are consistent with the recommended description in GALL-SLR Report table XI-01 "FSAR Supplement Summaries for GALL-SLR Report Chapter XI Aging Management Programs." The staff also noted that the applicant committed to implement the program and SLR enhancements when applicable 6 months prior to the subsequent period of extended operation. The staff finds that the description of program in the UFSAR supplement is adequate.

Conclusion. Based on the review of the applicant's electrical insulation for electrical cables and connections not subject to 10 CFR 50.49 environmental qualification requirements used in instrumentation circuits program, the staff concludes that the environmental requirements used in instrumentation circuits will be consistent without exception to the 10 elements of NUREG-2191. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d)

3.0.3.1.13 Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

SLRA section B.2.3.40 describes the new electrical insulation for inaccessible low-voltage power cables not subject to 10 CFR 50.49 environmental qualification requirements program as consistent with GALL-SLR Report AMP XI.E3C, "Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements," as modified by SLR–ISG-2021-04-ELECTRICAL (ML20181A395), "Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance."

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report as modified by SLR–ISG-2021-04-ELECTRICAL

(ML20181A395). The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA to the corresponding program elements of GALL–SLR Report AMP XI.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL (ML20181A395).

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report, as modified by SLR–ISG-2021-04-ELECTRICAL (ML20181A395). Based on a review of the SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL (ML20181A395).

Operating Experience. SLRA section B.2.3.40 summarizes OE related to the electrical insulation for inaccessible low-voltage power cables not subject to 10 CFR 50.49 environmental qualification requirements program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff conducted an independent review of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the electrical insulation for inaccessible low-voltage power cables not subject to 10 CFR 50.49 environmental qualification requirements program was evaluated.

UFSAR Supplement. Section 19.2.2.40 of appendices A1and A2 of the SLRA provides the UFSAR supplements for the electrical insulation for inaccessible low-voltage power cables not subject to 10 CFR50.49 environmental qualification requirements program. The staff reviewed the UFSAR supplement descriptions of the program and noted that it is consistent with the recommended description in GALL-SLR Report table XI-01. The staff finds that the information in the UFSAR supplements is an adequate summary description of the program.

Conclusion. Based on the review of the applicant’s electrical insulation for inaccessible low-voltage power cables not subject to 10 CFR 50.49 environmental qualification requirements program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report, as modified by SLR-ISG-2021-04-ELECTRICAL (ML20181A395), are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplements for this AMP and concludes that they provide an adequate summary description of the program, as required by 10 CFR 54.21(d)

3.0.3.1.14 Metal Enclosed Bus

SLRA section B.2.3.41 notes that the metal enclosed bus program is a new program that will be consistent with the program elements in the GALL-SLR Report AMP XI.E4, “Metal Enclosed Bus.”

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.E4.

Operating Experience. SLRA section B.2.3.41 summarizes OE related to the metal enclosed bus program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff conducted an independent search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the metal enclosed bus program was evaluated.

UFSAR Supplement. Section 19.2.2.41 of appendices A1 and A2 of the SLRA provides the UFSAR supplement for the metal enclosed bus program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report, table XI-01. The staff also noted that the applicant committed (Commitment No. 44) to implement the new metal enclosed bus program 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on the review of the applicant's metal enclosed bus program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.15 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

SLRA section B.2.3.42 notes that the electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements program is a new program that will be consistent with the program elements in the GALL-SLR Report AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.E6.

Operating Experience. SLRA section B.2.3.42 summarizes OE related to the electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements program.

The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff conducted an independent search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements program was evaluated.

UFSAR Supplement. Section 19.2.2.42 of appendices A1 and A2 of the SLRA provides the UFSAR supplement for the electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report table XI-01. The staff also noted that the applicant committed (Commitment No. 45) to implement the new electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements program 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior to the subsequent period of extended operation for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on the review of the applicant's electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.16 High-Voltage Insulators

SLRA section B.2.3.43 notes that the high-voltage insulators program is a new program that will be consistent with program elements in the GALL-SLR Report AMP XI.E7, "High-Voltage Insulators," as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance."

Staff Evaluation. During the audit (ML22188A086), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report as modified by SLR-ISG-2021-04-ELECTRICAL (ML20181A395). The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.E7, as modified by SLR-ISG-2021-04-ELECTRICAL (ML20181A395).

Operating Experience. SLRA section B.2.3.43 summarizes OE related to the high-voltage insulators program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML22188A086), the staff conducted an independent search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on the audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the high-voltage insulators program was evaluated.

UFSAR Supplement. Section 19.2.2.43 of appendices A1 and A2 provides the UFSAR supplement for the high-voltage insulators program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report, table XI-01 as modified by SLR-ISG-2021-04-ELECTRICAL (ML20181A395). The staff also noted that the applicant committed (Commitment No. 46) to implement the new high-voltage insulators program 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior to the subsequent period of extended operation for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on the review of the applicant's high-voltage insulators program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report as modified by SLR-ISG-2021-04-ELECTRICAL (ML20181A395) are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.4 QA Program Attributes Integral to Aging Management Programs

The regulations at 10 CFR 54.21(a)(3) regulations require SLR applicants to demonstrate that, for SCs subject to an AMR, they will adequately manage aging in a way that maintains intended function(s) consistent with the CLB for the subsequent period of extended operation. SRP-SLR, appendix A.1, Branch Technical Position (BTP) RLSB-1, "Aging Management Review—Generic," describes 10 elements of an acceptable AMP. Program elements 7, 8, and 9 are associated with the QA activities of corrective actions, confirmation process, and administrative controls, respectively. BTP RLSB-1, table A.1-1, "Elements of an Aging Management Program for Subsequent License Renewal," provides the following description of these program elements:

- Corrective Actions—Corrective actions, including root cause determination and prevention of recurrence, should be timely.

- Confirmation Process—Confirmation process should ensure that corrective actions have been completed and are effective.

- Administrative Controls—Administrative controls should provide a formal review and approval process.

SRP-SLR appendix A.2, BTP IQMB-1, "Quality Assurance for Aging Management Programs," notes that AMP aspects that affect the quality of safety-related SSCs are subject to the QA requirements of 10 CFR part 50, appendix B, "Quality Assurance Criteria for Nuclear Power

Plants and Fuel Reprocessing Plants.” Additionally, the SRP-SLR states that, for nonsafety-related SCs subject to an AMR, applicants may use the existing 10 CFR part 50, appendix B, “Quality Assurance Program,” to address program element 7 (“corrective actions”), program element 8 (“confirmation process”), and program element 9 (“administrative controls”). BTP IQMB-1 provides the following guidance on the QA attributes of AMPs:

- Safety-related SCs are subject to 10 CFR part 50, appendix B requirements, which are adequate to address all quality related aspects of an AMP consistent with the CLB of the facility for the subsequent period of extended operation.

- For nonsafety-related SCs that are subject to an AMR for SLR, an applicant has the option to expand the scope of its 10 CFR part 50, Appendix B program to include these SCs to address [program element 7] corrective actions, [program element 8] confirmation process, and [program element 9] administrative controls for aging management during the subsequent period of extended operation. The reviewer verifies that the applicant has documented such a commitment in the FSAR supplement in accordance with 10 CFR 54.21(d).

If an applicant chooses an alternative means to address corrective actions, confirmation process, and administrative controls for managing aging of nonsafety-related SCs that are subject to an AMR for SLR, the applicant’s proposal is reviewed on a case-by-case basis following the guidance in BTP RLSB1.

3.0.4.1 Summary of Technical Information in Application

SLRA appendix A1, “Unit 1 Updated Final Safety Analysis Report Supplement,” section 19.1.3, “Quality Assurance Program and Administrative Controls”; SLRA appendix A2, “Unit 2 Updated Final Safety Analysis Report Supplement,” section 19.1.3, “Quality Assurance Program and Administrative Controls”; and SLRA appendix B, “Aging Management Programs,” section B.1.3, “Quality Assurance Program and Administrative Controls,” describe the elements of corrective actions, confirmation process, and administrative controls applied to the AMPs for both safety-related and nonsafety-related components.

SLRA appendix A, section 19.1.3, states, in part:

> The FPL Quality Assurance (QA) Program for PSL implements the requirements of 10 CFR 50, Appendix B, and is consistent with the summary in Appendix A.2, “Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1),” of NUREG-2192. The FPL QA Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to the safety-related and nonsafety-related SSCs and commodity groups that are included within the scope of the AMPs.

SLRA appendix B, section B.1.3, states, in part:

The FPL Quality Assurance (QA) Program for PSL implements the requirements of 10 CFR 50, Appendix B, “Quality Assurance Requirements for Nuclear Power Plants and Fuel Reprocessing Plants,” and is consistent with the summary in Appendix A.2, “Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1),” of NUREG-2192. The [FPL] QA Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to the SR and NNS SSCs and commodity groups that are included within the scope of the AMPs.

3.0.4.2 Staff Evaluation

The staff reviewed SLRA appendix A1, section 19.1.3; SLRA appendix A2, section 19.1.3; and SLRA appendix B, section B.1.3, which describe how the applicant's existing QA program includes the QA-related elements (corrective actions, confirmation process, and administrative controls) for AMPs, consistent with the staff's guidance described in BTP IQMB-1 and is applicable to safety-related and nonsafety-related SSCs and commodity groups within the scope of AMPs. Based on the review, the staff determined that the QA attributes presented in the AMP basis documents and the associated AMPs are consistent with the staff's position on QA for aging management.

3.0.4.3 Conclusion

On the basis of the staff's review of SLRA appendix A1, section 19.1.3; SLRA appendix A2, section 19.1.3; and SLRA appendix B, section B.1.3, the staff finds that the QA attributes presented in the AMP basis documents and the associated AMPs are consistent with SRP-SLR BTPs RLSB-1 and IQMB-1 and that the QA attributes will be maintained such that the applicant will adequately manage aging in a way that maintains intended function(s) consistent with the CLBs for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.0.5 Operating Experience for Aging Management Programs

3.0.5.1 Summary of Technical Information in the Application

SLRA appendix A1, section 19.1.4, "Operating Experience Program"; SLRA appendix A2, section 19.1.4, "Operating Experience Program"; and SLRA appendix B, section B.1.4, "Operating Experience," describe the consideration of OE for AMPs. These sections state that the applicant systematically reviews plant-specific and industry OE concerning aging management and age-related degradation to ensure that the SLR AMPs will be effective in managing the aging effects for which they are credited. OE for the programs credited with managing the effects of aging are reviewed to identify corrective actions that may result in program enhancements.

3.0.5.2 Staff Evaluation

3.0.5.2.1 Overview

In accordance with 10 CFR 54.21(a)(3), an applicant is required to demonstrate that the effects of aging on SCs subject to an AMR will be adequately managed so that their intended functions will be maintained in a way that is consistent with the CLB for the subsequent period of extended operation. SRP-SLR, appendix A.4, "Operating Experience for Aging Management Programs," states that the systematic review of plant-specific and industry OE, including relevant research and development concerning aging management and age-related degradation, ensures that the SLR AMPs are, and will continue to be, effective in managing the aging effects for which they are credited. In addition, the SRP-SLR states that the AMPs should either be enhanced or new AMPs developed, as appropriate, when it is determined through the evaluation of OE that the effects of aging may not be adequately managed. AMPs should be informed by the review of OE on an ongoing basis, regardless of the AMPs' implementation schedule.

3.0.5.2.2 Consideration of Future Operating Experience

The staff reviewed SLRA appendix A1, section 19.1.4; SLRA appendix A2, section 19.1.4; and SLRA appendix B, section B.1.4, to determine how the applicant will use future OE to ensure that the AMPs are effective. The staff evaluated the applicant's OE review activities as described in the SLRA.

3.0.5.2.3 Acceptability of Existing Programs

SRP-SLR section A.4.2, "Position," describes existing programs generally acceptable to the staff for the capture, processing, and evaluating of OE concerning age-related degradation and aging management during the term of a subsequent renewed operating license. The acceptable programs are those relied on to meet the requirements of 10 CFR part 50, appendix B, and item I.C.5, "Procedures for Feedback of Operating Experience to Plant Staff," in NUREG-0737, "Clarification of TMI Action Plan Requirements," issued November 1980 (ML051400209), as incorporated into the licensee's technical specifications. SRP-SLR section A.4.2 also states that, as part of meeting the requirements of NUREG-0737, item I.C.5, the applicant's OE program should rely on active participation in the Institute of Nuclear Power Operations (INPO) OE program (formerly the INPO Significant Event Evaluation and Information Network [SEE IN]) endorsed in GL 82-04, "Use of INPO SEE-IN Program," dated March 9, 1982.

SLRA appendix A1, section 19.1.4; SLRA Appendix A2, section 19.1.4; and SLRA appendix B, section B.1.4, state that the applicant uses its OE program to systematically capture and review OE from plant-specific and industry sources. The SLRA also states that the OE program meets the requirements of NUREG-0737. The SLRA further states that the OE program interfaces and relies on active participation in the INPO OE program. Based on this information, the staff determined that the applicant's OE program is consistent with the programs described in SRP-SLR section A.4.2.

3.0.5.2.4 Areas of Further Review

<u>Application of Existing Programs and Procedures to the Processing of Operating Experience Related to Aging</u>. SRP-SLR section A.4.2 states that the programs and procedures relied on to meet the requirements of 10 CFR part 50, appendix B, and NUREG-0737, item I.C.5, should not preclude the consideration of OE on age-related degradation and aging management.

SLRA appendix A1, section 19.1.4; SLRA appendix A2, section 19.1.4; and SLRA appendix B, section B.1.4, state that OE from plant-specific and industry sources are systematically captured and reviewed on an ongoing basis in accordance with the QA program, which is consistent with 10 CFR Part 50, appendix B, and the OE program, which is consistent with NUREG-0737, item I.C.5. The SLRA also states that the ongoing evaluation of OE includes a review of corrective actions, which may result in program enhancements. The SLRA further states that trending reports, program health reports, assessments, and corrective actions program items were reviewed to determine whether aging effects have been identified on applicable components.

Based on this information, the staff determined that the processes implemented under the applicant's QA, corrective actions, and OE programs would not preclude consideration of age-related OE, which is consistent with the guidance in SRP-SLR section A.4.2.

In addition, SRP-SLR section A.4.2 states that the applicant should use the option described in SRP-SLR appendix A.2 to expand the scope of the QA program in 10 CFR part 50, appendix B, to include nonsafety-related SCs.

SLRA appendix A1, section 19.1.4; SLRA appendix A2, section 19.1.4; and SLRA appendix B, section B.1.3, state that the applicant's QA program includes nonsafety-related SCs, which the staff finds consistent with the guidance in SRP-SLR section A.2 and therefore consistent with SRP-SLR section A.4.2 as well. SE section 3.0.4 documents the staff's evaluation of SLRA appendix A, section 19.1.3, and SLRA appendix B, section B.1.3, relative to the application of the QA program to nonsafety-related SSCs.

Consideration of Guidance Documents as Industry Operating Experience. SRP-SLR section A.4.2 states that NRC and industry guidance documents and standards applicable to aging management, including revisions to the GALL-SLR Report, should be considered as sources of industry OE and evaluated accordingly.

SLRA appendix B, section B.1.4, states that the sources of external OE include the INPO OE program, GALL-SLR Report revisions, and other NRC review and guidance documentation.

Based on the review, the staff finds that the applicant will consider an appropriate breadth of industry OE for impacts on its aging management activities, which includes sources that the staff considers to be the primary sources of external OE information. Because the applicant's consideration of guidance documents as industry OE is consistent with the guidance in SRP-SLR section A.4.2, the staff finds the OE program acceptable.

Screening of Incoming Operating Experience. SRP-SLR section A.4.2 states that all incoming plant-specific and industry OE should be screened to determine whether it involves age-related degradation or impacts to aging management activities.

SLRA appendix A1, section 19.1.4; SLRA appendix A2, section 19.1.4; and SLRA appendix B, section B.1.4, state that internal and external OE is captured and systematically reviewed on an ongoing basis and that the OE program provides for evaluation of site-specific and industry OE items that are screened to determine whether they involve lessons learned that may impact AMPs. Items are evaluated, and affected AMPs are either enhanced or new AMPs are developed, as appropriate, when it is determined that the effects of aging are not adequately managed. Based on the review, the staff finds that the applicant's OE review processes will include screening of all new OE to identify and evaluate items that can impact aging management activities. Because the applicant's screening of incoming OE is consistent with the guidance in SRP-SLR section A.4.2, the staff finds the OE program acceptable.

Identification of Operating Experience Related to Aging. SRP-SLR section A.4.2 states that coding should be used within the plant corrective actions program to identify OE involving age-related degradation applicable to the plant. The SRP-SLR also states that the associated entries should be periodically reviewed, and any adverse trends should receive further evaluation.

SLRA appendix B, section B.1.4, states that the corrective actions program identifies either plant-specific OE related to aging or industry OE related to aging, allowing the tracking and trending of this information.

Based on the review, the staff finds the applicant's identification of OE related to aging is consistent with the guidance in SRP-SLR section A.4.2; therefore, the staff finds the OE program acceptable.

<u>Information Considered in Operating Experience Evaluations</u>. SRP-SLR section A.4.2 states that OE identified as involving aging should receive further evaluation based on consideration of the information, such as the affected SSCs, materials, environments, aging effects, aging mechanisms, and AMPs. The SRP-SLR also states that actions should be initiated within the corrective actions program to either enhance the AMPs or develop and implement new AMPs if an OE evaluation finds that the effects of aging may not be adequately managed.

SLRA appendix A1, section 19.1.4; SLRA appendix A2, section 19.1.4; and SLRA appendix B, section B.1.4, state that the applicant's program requires that, when evaluations indicate that the effects of aging are not being adequately managed, the affected AMPs are either enhanced or new AMPs are developed, as appropriate.

The staff determined that the applicant's evaluations of age-related OE must include the assessment of appropriate information to determine potential impacts on aging management activities. The staff also determined that the applicant's OE program, in conjunction with the corrective actions program, would implement any changes necessary to manage the effects of aging, as determined through its OE evaluations. Therefore, the staff finds that the information considered in the applicant's OE evaluations and the use of the OE program and the corrective actions program to ensure that the effects of aging are adequately managed are consistent with the guidance in SRP-SLR section A.4.2.

<u>Evaluation of AMP Implementation Results</u>. SRP-SLR section A.4.2 states that the results of implementing the AMPs, such as data from inspections, tests, and analyses, should be evaluated regardless of whether the acceptance criteria of the particular AMP have been met. SRP-SLR section A.4.2 states that this information should be used to determine whether it is necessary to adjust the inspection activities for aging management. In addition, SRP-SLR section A.4.2 states that actions should be initiated within the plant corrective actions program to either enhance the AMPs or develop and implement new AMPs if these evaluations indicate that the effects of aging may not be adequately managed.

SLRA appendix B, section B.1.4, states that internal OE is found in health reports, program assessments, and the 10 CFR part 50, appendix B corrective actions program. In addition, SLRA appendix A1, section 19.1.4; SLRA appendix A2, section 19.1.4; and SLRA appendix B, section B.1.4, state that either AMPs are enhanced or new AMPs developed, as appropriate, when it is determined through the evaluation of OE that the effects of aging may not be adequately managed. SLRA appendix B, section B1.4, states that the OE program also meets the requirements of NEI 14-12, "Aging Management Program Effectiveness," for periodic program assessments. In addition, SLRA appendix B, section B.1.4, states that AMP and OE assessments would be performed on a periodic basis not to exceed 5 years.

Based on the review, the staff finds that the applicant's treatment of AMP implementation results as OE is consistent with the guidance in SRP-SLR section A.4.2; therefore, the staff finds the OE program acceptable.

Training. SRP-SLR section A.4.2 states that training on age-related degradation and aging management should be provided to those personnel responsible for implementing the AMPs and those personnel that may submit, screen, assign, evaluate, or otherwise process plant-specific and industry OE. SRP-SLR section A.4.2 also states that the training should be periodic and include provisions to accommodate the turnover of plant personnel.

SLRA appendix A1, section 19.1.4, and SLRA appendix A2, section 19.1.4, state that the OE program provides for training to those responsible for activities including screening, evaluating, and processing OE items related to aging management and age-related degradation.

Based on the review, the staff finds that the scope of personnel included in the applicant's training program is consistent with the guidance in SRP-SLR section 4.2; therefore, the staff finds the OE program acceptable.

Reporting Operating Experience to the Industry. SRP-SLR section A.4.2 states that guidelines should be established for reporting plant-specific OE to the industry on age-related degradation and aging management.

SLRA appendix A1, section 19.1.4; SLRA appendix A2, section 19.1.4; and SLRA appendix B, section B.1.4, state that the applicant's OE program actively participates in the INPO OE program. Based on the review, the staff finds that the applicant's reporting of OE to the industry is consistent with the guidance in SRP-SLR section 4.2; therefore, the staff finds the OE program acceptable.

Schedule for Implementing the Operating Experience Review Activities. SRP-SLR section A.4.2 states that the OE review activities should be implemented on an ongoing basis throughout the term of a subsequent renewed license.

SLRA appendix B, section B.1.4, states that the applicant's self-assessment process provides for periodic evaluation of the effectiveness of the OE program described in the UFSAR supplement. SLRA appendix A1, section 19.1.4; SLRA appendix A2, section 19.1.4; and SLRA appendix B, section B.1.4, state that the OE program will be implemented on an ongoing basis throughout the terms of the subsequent renewed licenses. SLRA appendix A1, section 19.1.4, and SLRA appendix A2, section 19.1.4, provide the UFSAR supplement summary description of the applicant's enhanced programmatic activities for the ongoing review of OE. Upon issuance of the subsequent renewed licenses in accordance with 10 CFR 54.3(c), this summary description will be incorporated into the CLBs, and, at that time, the applicant will be obligated to conduct its OE review activities accordingly.

The staff finds the implementation schedule acceptable because the applicant will implement the OE review activities on an ongoing basis throughout the term of the subsequent renewed operating licenses.

3.0.5.2.5 Conclusion

Based on the review of the SLRA, the staff determined that the applicant's programmatic activities for the ongoing review of OE are acceptable for: (a) the systematic review of plant-specific and industry OE to ensure that the subsequent license renewal AMPs are, and will continue to be, effective in managing the aging effects for which they are credited, and (b) the enhancement of AMPs or the development of new AMPs when it is determined through the evaluation of OE that the effects of aging may not be adequately managed. Based on the review, the staff finds that the applicant's OE review activities are consistent with the guidance in SRP-SLR section 4.2; therefore, the staff finds the applicant's programmatic activities for the ongoing review of OE acceptable.

3.0.5.3 UFSAR Supplement

In accordance with 10 CFR 54.21(d), the UFSAR supplement must, in part, contain a summary description of the programs and activities for managing the effects of aging. SLRA appendix A1, section 19.1.4, and SLRA appendix A2, section 19.1.4, provide the UFSAR supplement summary description of the applicant's programmatic activities for the ongoing review of OE that will ensure that plant-specific and industry OE related to aging management will be used effectively.

Based on the review, the staff determined that the content of the applicant's summary description is consistent with guidance and also is sufficiently comprehensive to describe the applicant's programmatic activities for evaluating OE to maintain the effectiveness of the AMPs. Therefore, the staff finds the applicant's UFSAR supplement summary description acceptable.

3.0.5.4 Conclusion

Based on the review of the applicant's programmatic activities for the ongoing review of OE, the staff finds that the applicant has demonstrated that OE will be reviewed to ensure that the effects of aging will be adequately managed so that the intended functions will remain consistent with the CLBs for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for these activities and finds that it provides an adequate summary description, as required by 10 CFR 54.21(d).

3.1 Aging Management of Reactor Vessels, Reactor Internals, and Reactor Coolant System

3.1.1 Summary of Technical Information in the Application

SLRA section 3.1 provides AMR results for those components that the applicant identified in SLRA section 2.3.1, "Reactor Coolant System (RCS)," as being subject to an AMR. SLRA table 3.1-1, "Summary of Aging Management Evaluations for the Reactor Vessel, Internals, and Reactor Coolant System," gives a summary comparison of the applicant's AMRs with those evaluated in the GALL-SLR Report for the RCS components and component groups.

3.1.2 Staff Evaluation

Table 3.1-1 summarizes the staff's evaluation of the component groups listed in SLRA section 3.1 and addressed in the GALL-SLR Report.

Table 3.1-1 Staff Evaluation for Evaluation for Reactor Vessel, Internals, and Reactor Coolant System Components in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1-1, 001	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.1)
3.1-1, 002	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.1)
3.1-1, 003	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.1)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1-1, 004	Not applicable to PSL (see SE section 3.1.2.2.1)
3.1-1, 005	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.1)
3.1-1, 006	Not applicable to PWRs
3.1-1, 007	Not applicable to PWRs
3.1-1, 008	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.1)
3.1-1, 009	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.1)
3.1-1, 010	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.1)
3.1-1, 011	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.1)
3.1-1, 012	Consistent with the GALL-SLR Report (see SE sections 3.1.2.2.2.1 and 3.1.2.2.2.2)
3.1-1, 013	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.3.1)
3.1-1, 014	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.3.2)
3.1-1, 015	Not applicable to PSL
3.1-1, 016	Not applicable to PWRs
3.1-1, 017	Not applicable to PWRs
3.1-1, 018	Not applicable to PSL (see SE section 3.1.2.2.5)
3.1-1, 019	Not applicable to PSL (see SE section 3.1.2.2.6.1)
3.1-1, 020	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.6.2)
3.1-1, 021	Not applicable to PWRs (see SE section 3.1.2.2.7)
3.1-1, 022	Not applicable to PSL (see SE section 3.1.2.2.8)
3.1-1, 023	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 024	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 025	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.11)
3.1-1, 026	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 027	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 028	Not applicable to PSL (see SE section 3.1.2.2.9)
3.1-1, 029	Not applicable to PWRs
3.1-1, 030	Not applicable to PWRs
3.1-1, 031	Not applicable to PWRs
3.1-1, 032	Not applicable to PWRs
3.1-1, 033	Consistent with the GALL-SLR Report
3.1-1, 034	Not applicable to PSL
3.1-1, 035	Consistent with the GALL-SLR Report
3.1-1, 036	Consistent with the GALL-SLR Report
3.1-1, 037	Consistent with the GALL-SLR Report
3.1-1, 038	Consistent with the GALL-SLR Report
3.1-1, 039	Consistent with the GALL-SLR Report
3.1-1, 040	Consistent with the GALL-SLR Report
3.1-1, 040a	Consistent with the GALL-SLR Report
3.1-1, 041	Not applicable to PWRs
3.1-1, 042	Consistent with the GALL-SLR Report
3.1-1, 043	Not applicable to PWRs
3.1-1, 044	Consistent with the GALL-SLR Report
3.1-1, 045	Consistent with the GALL-SLR Report
3.1-1, 046	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1-1, 047	Consistent with the GALL-SLR Report
3.1-1, 048	Consistent with the GALL-SLR Report
3.1-1, 049	Consistent with the GALL-SLR Report
3.1-1, 050	Consistent with the GALL-SLR Report
3.1-1, 051a	Not applicable to PWRs
3.1-1, 051b	Not applicable to PWRs
3.1-1, 052a	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.9)
3.1-1, 052b	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.9)
3.1-1, 052c	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.9)
3.1-1, 053a	Not applicable to PWRs
3.1-1, 053b	Not applicable to PWRs
3.1-1, 053c	Not applicable to PWRs
3.1-1, 054	Not applicable to PWRs
3.1-1, 055a	Not applicable to PWRs
3.1-1, 055b	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.9)
3.1-1, 055c	Not applicable to PWRs
3.1-1, 056a	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.9)
3.1-1, 056b	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.9)
3.1-1, 056c	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.9)
3.1-1, 057	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 058a	Not applicable to PWRs
3.1-1, 058b	Not applicable to PWRs
3.1-1, 059a	Not applicable to PWRs
3.1-1, 059b	Not applicable to PWRs
3.1-1, 059c	Not applicable to PWRs
3.1-1, 060	Not applicable to PWRs
3.1-1, 061	Consistent with the GALL-SLR Report
3.1-1, 062	Consistent with the GALL-SLR Report
3.1-1, 063	Not applicable to PWRs
3.1-1, 064	Consistent with the GALL-SLR Report
3.1-1, 065	Not applicable to PSL
3.1-1, 066	Consistent with the GALL-SLR Report
3.1-1, 067	Consistent with the GALL-SLR Report
3.1-1, 068	Not applicable to PSL
3.1-1, 069	Consistent with the GALL-SLR Report
3.1-1, 070	Consistent with the GALL-SLR Report
3.1-1, 071	Consistent with the GALL-SLR Report
3.1-1, 072	Consistent with the GALL-SLR Report
3.1-1, 073	Not applicable to PSL
3.1-1, 074	Consistent with the GALL-SLR Report
3.1-1, 075	Not applicable to PSL
3.1-1, 076	Consistent with the GALL-SLR Report
3.1-1, 077	Consistent with the GALL-SLR Report
3.1-1, 078	Not used

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1-1, 079	Not applicable to PWRs
3.1-1, 080	Not applicable to PSL
3.1-1, 081	Not applicable to PSL
3.1-1, 082	Not applicable to PSL
3.1-1, 083	Not used. Addressed by 3.1-1, 012
3.1-1, 084	Not applicable to PWRs
3.1-1, 085	Not applicable to PWRs
3.1-1, 086	Consistent with the GALL-SLR Report
3.1-1, 087	Consistent with the GALL-SLR Report
3.1-1, 088	Consistent with the GALL-SLR Report
3.1-1, 089	Not applicable to PSL
3.1-1, 090	Not applicable to PSL
3.1-1, 091	Not applicable to PWRs
3.1-1, 092	Consistent with the GALL-SLR Report
3.1-1, 093	Not applicable to PSL
3.1-1, 094	Not applicable to PWRs
3.1-1, 095	Not applicable to PWRs
3.1-1, 096	Not applicable to PWRs
3.1-1, 097	Not applicable to PWRs
3.1-1, 098	Not applicable to PWRs
3.1-1, 099	Not applicable to PWRs
3.1-1, 100	Not applicable to PWRs
3.1-1, 101	Not applicable to PWRs
3.1-1, 102	Not applicable to PWRs
3.1-1, 103	Not applicable to PWRs
3.1-1, 104	Not applicable to PWRs
3.1-1, 105	Not applicable to PSL (see SE section 3.1.2.2.15)
3.1-1, 106	Not used
3.1-1, 107	Not used
3.1-1, 108	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 109	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 110	Not applicable to PWRs
3.1-1, 111	Consistent with the GALL-SLR Report
3.1-1, 112	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 113	Not applicable to PWRs
3.1-1, 114	Consistent with the GALL-SLR Report
3.1-1, 115	Not applicable to PSL (see SE section 3.1.2.2.15)
3.1-1, 116	Not applicable to PSL
3.1-1, 117	Not applicable to PSL
3.1-1, 118	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.9)
3.1-1, 119	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.9)
3.1-1, 120	Not applicable to PWRs
3.1-1, 121	Not applicable to PWRs
3.1-1, 122	This item number is not used in the SRP-SLR or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1-1, 123	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 124	Consistent with the GALL-SLR Report
3.1-1, 125	Consistent with the GALL-SLR Report
3.1-1, 126	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 127	Consistent with the GALL-SLR Report
3.1-1, 128	Not applicable to PWRs
3.1-1, 129	Not applicable to PWRs
3.1-1, 130	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 131	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 132	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 133	Not applicable to PWRs
3.1-1, 134	Not applicable to PSL
3.1-1, 135	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 136	Consistent with the GALL-SLR Report (see SE section 3.1.2.2.16)
3.1-1, 137	Not applicable to PSL
3.1-1, 138	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1, 139	Not applicable to PSL (see SE section 3.1.2.2.6, Item 3)

The following three sections summarize the staff's review of component groups, as described in SE section 3.0.2.2:

(1) SE section 3.1.2.1 discusses AMR results for components that the applicant stated either are not applicable to PSL or are consistent with the GALL-SLR Report. Section 3.1.2.1.1 summarizes the staff's review of items that are not applicable or not used and documents any RAIs issued and the staff's conclusions. The remaining subsections in SE section 3.1.2.1 document the review of components that required additional information or otherwise required explanation.

(2) SE section 3.1.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

SE section 3.1.2.3 discusses AMR results for components that the applicant stated are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the SLRA.

3.1.2.1 Aging Management Review Results Consistent with the GALL-SLR Report

The following subsections document the staff's review of those AMR results listed in SLRA tables 3.1.2-1 through 3.1.2-5 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat the review of the matters described in the GALL-SLR Report; however, the staff did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-SLR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions as documented in the GALL-SLR Report are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SE table 3.1-1, and no separate writeup is required or provided.

SE section 3.1.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable or not used.

3.1.2.1.1 Aging Management Review Results Identified as Not Applicable or Not Used

For SLRA table 3.1-1, items 3.1-1, 004; 3.1-1, 015; 3.1-1, 018; 3.1-1, 022; 3.1-1, 028; 3.1-1, 034; 3.1-1, 065; 3.1-1, 068; 3.1-1, 073; 3.1-1, 075; 3.1-1, 078; 3.1-1, 080; 3.1-1, 081; 3.1-1, 082; 3.1-1, 083; 3.1-1, 089; 3.1-1, 090; 3.1-1, 093; 3.1-1, 105, through 3.1-1, 107; 3.1-1, 115; 3.1-1, 116; 3.1-1, 117; 3.1-1, 134; 3.1-1, 137; and 3.1-1, 139, the applicant claimed that the corresponding AMR items in the GALL-SLR Report are not applicable to PSL. The staff reviewed the SLRA, the description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents, and confirmed that the applicant's SLRA does not have any AMR results that are applicable to these items.

For SLRA table 3.1-1, items 3.1-1, 006; 3.1-1, 007; 3.1-1, 016; 3.1-1, 017; 3.1-1, 021; 3.1-1, 029, through 3.1-1, 032; 3.1-1, 041; 3.1-1, 043; 3.1-1, 051a; 3.1-1, 051b; 3.1-1, 053a, through 3.1-1, 055a; 3.1-1, 055c; 3.1-1, 058a, through 3.1-1, 060; 3.1-1, 063; 3.1-1, 084; 3.1-1, 085; 3.1-1, 091; 3.1-1, 094, through 3.1-1, 104; 3.1-1, 110; 3.1-1, 113; 3.1-1, 120; 3.1-1, 121; 3.1-1, 128; 3.1-1, 129; and 3.1-1, 133, the applicant claimed that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items apply only to boiling-water reactors (BWRs). The staff reviewed the SRP-SLR, confirmed that these items apply only to BWRs, and finds that these items are not applicable to PSL, because it is a PWR.

3.1.2.2 Aging Management Review Results for Which the GALL-SLR Report Recommends Further Evaluation

In SLRA section 3.1.2.2, the applicant further evaluated aging management for the RCS components, as recommended by the GALL-SLR Report, and explained how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria in SRP-SLR section 3.1.2.2. The following subsections document the staff's review.

3.1.2.2.1 Cumulative Fatigue Damage

SLRA section 3.1.2.2.1 is associated with SLRA table 3.1-1, items 001, 002, 003, 005, 008, 009, 010, and 011. The section states that the TLAAs on cumulative fatigue damage in RCS components are evaluated in accordance with 10 CFR 54.21(c)(1) and addressed in SLRA section 4.3. This is consistent with SRP-SLR section 3.1.2.2.1 and is therefore acceptable. SE sections 4.3.1 and 4.3.3 document the staff's evaluation of the TLAAs for RCS components.

In addition, the applicant determined that SLRA table 3.1-1, item 004, for reactor vessel (RV) support skirts is not applicable to the PSL plant because there is no support skirt, and the RV is supported by RV nozzles. The staff evaluated the applicant's determination in accordance with SRP-SLR section 3.1.2.2.1 and finds it acceptable, because a review of the UFSAR confirms that there is no support skirt for the RV.

3.1.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed SLRA section 3.1.2.2.2 against the criteria in SRP-SLR section 3.1.2.2.2. SLRA section 3.1.2.2.2, items 1 and 2, are associated with SLRA table 3.1-1, item 3.1-1, 012, which addresses loss of material due to general, pitting, and crevice corrosion for Westinghouse

Model 44 and 51 steam generators (SGs). The applicant stated that these further evaluation items apply only to Westinghouse SGs and are not applicable to PSL, Units 1, and 2, which have Combustion Engineering (CE) SGs. The staff has noted that the associated items in the SLRA are applicable only to Westinghouse Model 44 and 51 SGs and therefore finds the applicant's claim acceptable.

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

Item 1. SLRA section 3.1.2.2.3, item 1, associated with SLRA table 3.1-1, item 3.1-1, 013, states that TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA is addressed in SLRA section 4.2, "Reactor Vessel Neutron Embrittlement Analysis." This is consistent with SRP-SLR section 3.1.2.2.3.1 and is therefore acceptable. SE section 4.2 documents the staff's evaluation of the TLAA for the reactor pressure vessel (RPV) beltline and extended beltline neutron fluence.

Item 2. SLRA section 3.1.2.2.3, item 2, associated with SLRA table 3.1-1, item 3.1-1, 014, addresses loss of fracture toughness due to neutron irradiation of the reactor pressure vessel beltline and extended beltline exposed to reactor coolant and neutron flux, which will be managed by the Reactor Vessel Material Surveillance Program and Neutron Fluence Monitoring Program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.1.2.2.3, item 2.

In the review of components associated with AMR item 3.1-1, 014, the staff finds that the applicant has met the further evaluation criteria and finds its proposal to manage the effects of aging for the reactor vessel using the Reactor Vessel Material Surveillance Program and Neutron Fluence Monitoring Program acceptable because it is consistent with AMR item IV.A2.RP-229 in the GALL-SLR Report. The staff's evaluation of the Neutron Fluence Monitoring Program and the Reactor Vessel Material Surveillance Program are documented in SE sections 3.0.3.2.2 and 3.0.3.2.19, respectively.

Based on the AMPs identified, the staff concludes that applicant's proposed AMPs meet SRP-SLR section 3.1.2.2.3, item 2 criteria. For SLRA table 3.1-1, item 3.1-1, 014, associated with SLRA section 3.1.2.2.3, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA section 3.1.2.2.3, item 3, is associated with SLRA table 3.1-1, AMR item 3.1-1, 015, which addresses the reduction of ductile fracture toughness in stainless steel or nickel alloy PWR reactor vessel internal (RVI) components exposed to a reactor coolant with neutron flux environment, which is to be managed through use and application of the generic TLAA in the Babcock and Wilcox (B&W) Owners Group report BAW-2248A. The applicant stated that this item is not applicable.

The staff evaluated the applicant's claim against the AMR further evaluation criteria in SRP-SLR section 3.1.2.2.3, item 3. The staff finds the applicant's claim acceptable, for two reasons:

(1) The AMR items in SRP-SLR table 3.1-1, item 015, and GALL-SLR AMR item IV.B4 (as updated in NRC interim staff guidance (ISG) SRL-ISG-2021-01-PWRVI (ML20217L203)) state that the applicable generic TLAA invoked by the referenced SRP-SLR AMR further evaluation criteria is applicable only to PWR RVI components designed by B&W.

(2) Section 1.1 of the UFSAR for PSL Units 1 and 2 confirms that the RVI components in the PSL reactor units were designed by CE, which was the nuclear steam supply system designer for the units.

3.1.2.2.4 Cracking Due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

Item 1. SLRA section 3.1.2.2.4, item 1, is associated with SLRA table 3.1-1, item 3.1-1, 016, which addresses cracking due to stress corrosion cracking (SCC) and intergranular SCC of the stainless steel or nickel alloy flange leak detection line in the RV top head enclosure when exposed to uncontrolled indoor air and to reactor coolant leakage. The applicant stated that this item is not applicable because it only applies to BWRs. Having evaluated the applicant's proposal against the criteria in SRP-SLR section 3.1.2.2.4, item 1, the staff finds it acceptable, because, as stated in the SRP-SLR, this issue is associated with BWR plants.

Item 2. The staff reviewed SLRA section 3.1.2.2.4, item 2, against the criteria in SRP-SLR section 3.1.2.2.4. The applicant stated that this item is not applicable to PSL, Units 1 and 2, which are PWR units. The staff confirmed that the associated item in the SLRA is applicable only to BWRs, and therefore finds the applicant's claim acceptable.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

SLRA section 3.1.2.2.5, associated with SLRA table 3.1-1, AMR item 3.1-1, 018, addresses crack growth due to cyclic loading that could occur in RPV shell forgings clad with stainless steel using a high-heat-input welding process exposed to reactor coolant. The applicant stated that this item is not applicable.

The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.1.2.2.5. Based on the information in SLRA section 3.1.2.2.5, the staff determined that PSL Units 1 and 2 RPVs are not susceptible to underclad reheat cracking nor underclad cold cracking because the vessel manufacturer did not use high-heat-input welding processes and heat treating practices that contributed to the cracking conditions. The applicant stated that the procedures indicate that the PSL RPVs were clad using lower-heat-input one-wire and two-wire submerged or shielded metal arc cladding processes with which reheat cracking was found by testing not to occur. The staff noted that preheating and post-heating were applied on multiple layers of cladding so that cold cracking is not likely to occur. The staff determined that both units replaced the RPV closure head forgings using SA-508 Class 3 material which is not susceptible to crack growth due to cyclic loading. Therefore, the staff finds that underclad cracking of the PSL RPVs and replacement heads is not an applicable aging mechanism. The staff also finds that as a result, the underclad cracking TLAA is not applicable to PSL Units 1 and 2.

3.1.2.2.6 Cracking Due to Stress Corrosion Cracking

Item 1. SLRA section 3.1.2.2.6, item 1, is associated with SLRA table 3.1-1, item 3.1-1, 019, which addresses the management of SCC in PWR RV bottom-mounted instrumentation (BMI) guide tubes exposed to a reactor coolant environment. The SLRA states that the PSL Unit 1 and 2 reactors are CE-designed and do not have BMIs; therefore, this further evaluation is not applicable. The staff noted that the associated item in the SLRA is applicable only to Westinghouse and B&W reactors, and it therefore finds the applicant's claim acceptable.

Item 2. SLRA section 3.1.2.2.6, item 2, is associated with SLRA table 3.1-1, AMR item 3.1-1, 020, which addresses cracking due to SCC for the cast austenitic stainless steel (CASS) surge nozzle safe-end components that are exposed to the reactor coolant, which will be managed by the water chemistry program. The applicant stated that SRP-SLR section 3.1.2.2.6, item 2, refers to guidance in NUREG-0313, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," Revision 2, issued January 1988. SRP-SLR section 3.1.2.2.6, item 2, suggests that the SCC could occur in Class 1 CASS RCS piping and components in PWRs that do not meet NUREG-0313 guidelines on ferrite and carbon content. The applicant addressed the further evaluation criteria of SRP-SLR section 3.1.2.2.6, item 2, by stating that the review of industry and PSL operating experience showed no instances of SCC for CASS components exposed to PWR reactor coolant. The applicant credited the water chemistry program to manage the effects of SCC for its Class 1 CASS RCS piping and components.

The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.1.2.2.6, item 2. In the review of components associated with AMR item 3.1-1, 020, the staff noted that these components are also covered by the applicant's existing program under ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD. The staff finds that the applicant has met the further evaluation criteria and its proposal is acceptable, because (1) the water chemistry program has demonstrated its ability to control the coolant chemistry to manage SCC in CASS, and (2) the plant-specific program for ASME Section XI inservice inspection subsections IWB, IWC, and IWD provides periodic inspections to monitor for potential cracking of CASS due to SCC. SE sections 3.0.3.1.2 and 3.0.3.1.1, respectively document the staff's evaluations of the water chemistry program and the ASME Section XI inservice inspection subsections IWB, IWC, and IWD program.

For the components associated with SLRA section 3.1.2.2.6, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of subsequent extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA section 3.1.2.2.6, item 3, is associated with SLRA table 3.1-1, AMR item 3.1-1, 139, which addresses cracking due to SCC in stainless steel or nickel alloy RV flange leak detection lines. The applicant stated that this item is not applicable, because each RV flange leak detection line includes a 3/16-inch diameter orifice in the RPV flange that limits any potential RCS leakage to within the capacity of a charging pump, in the unlikely event of leakage past the inner O-ring. Additionally, the applicant reviewed the last 10 years of operating experience and found that no action requests had been generated in relation to RPV flange cracking. Since the leak detection lines are not safety-related and their potential failure would not prevent satisfactory accomplishment of any safety-related functions, they do not perform or support any license renewal intended functions that meet the scoping criteria of 10 CFR 54.4(a); therefore, an AMR is not required. This position was also documented during initial license renewal (ML022810608) through the applicant's response to RAI 2.3.1-3 regarding the reactor vessel flange leak detection lines issue. The staff evaluated RAI 2.3.1-3 in NUREG-1779, "Safety Evaluation Report Related to the License Renewal of St. Lucie Nuclear Plant, Units 1 and 2," issued September 2003 (ML032940205). Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.1.2.2.6, item 3, the staff finds it acceptable based on the lack of action requests generated in the last 10 years in the corrective action program, and on the response to RAI 2.3.1-3.

3.1.2.2.7 Cracking Due to Cyclic Loading

The staff reviewed SLRA section 3.1.2.2.7, which is associated with SLRA table 3.1-1, AMR item 3.1-1, 021, against the criteria in SRP-SLR section 3.1.2.2.7. The applicant stated that this item is not applicable to PSL, Units 1 and 2, which are PWR units, because the associated item in SLRA table 3.1-1 is applicable only to BWRs. The staff confirmed that this item is associated only with BWRs, and, therefore, finds the applicant's claim acceptable.

3.1.2.2.8 Loss of Material Due to Erosion

SLRA section 3.1.2.2.8, is associated with SLRA table 3.1-1, AMR item 3.1-1, 022, which addresses loss of material due to erosion for steel SG feedwater impingement plates and supports exposed to secondary feedwater. The applicant stated that this AMR item is not applicable. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.1.2.2.8, the staff finds it acceptable, because the applicant's SGs do not have feedwater impingement plates or the associated supports.

3.1.2.2.9 Aging Management of Pressurized-Water Reactor Vessel Internals

SLRA section 3.1.2.2.9 is associated with SLRA table 3.1-1, items 3.1-1, 028; 3.1-1, 051a; 3.1-1, 051b; 3.1-1. 052a; 3.1-1, 052b; 3.1-1, 052c; 3.1-1, 053a; 3.1-1, 053b; 3.1-1, 053c; 3.1-1, 055a; 3.1-1, 055b; 3.1-1, 055c; 3.1-1, 056a; 3.1-1, 056b; 3.1-1, 056c; 3.1-1, 058a; 3.1-1, 058b; 3.1-1, 059a; 3.1-1, 059b; 3.1-1, 059c; 3.1-1, 118; and 3.1-1, 119, which address management of cracking (due to SCC, irradiation-assisted SCC, or fatigue), loss of fracture toughness (due to neutron irradiation embrittlement or thermal aging embrittlement), loss of preload (due to irradiation-assisted stress relaxation or creep), loss of material (due to wear), and changes in dimension (due to void swelling or distortion) in specified PWR RVI components that (1) are exposed to a reactor coolant with neutron flux environment, and (2) will be managed either by the applicant's RVI program (SLRA AMP B.2.3.7), or by a combination of the latter and the water chemistry program (SLRA AMP B.2.3.2).

The staff reviewed the applicant's table 1 AMR line items for the PSL RVI components in SLRA table 3.1-1 and the associated table 2 AMR line items for the RVI components in SLRA table 3.1.2-2 (as amended, including changes made to the AMR items in the applicant's letters of April 7, 2022 (ML22097A202), and June 13, 2022 (ML22164A802)), comparing them to the corresponding AMR item criteria in the SRP-SLR and the GALL-SLR Report, as updated in appendices A and B.3 of SLR-ISG-2021-01-PWRVI. The staff applied the review procedures in SRP-SLR section 3.1.3.2.9 (as amended in appendix C of SLR-ISG-2021-01-PWRVI) as the basis for the review of the revised AMR line items. The subsections below give the staff's evaluations of the applicable AMR items from table 1 (SLRA table 3.1-1) and table 2 (SLRA table 3.1.2-2).

SLRA table 3.1-1, items 3.1-1, 028; 3.1-1, 051a; 3.1-1, 051b, 3.1-1, 053a; 3.1-1, 053b, 3.1-1, 053c; 3.1-1, 055a; 3.1-1, 055c; 3.1-1, 058a; 3.1-1, 058b; 3.1-1, 059a; 3.1-1, 059b; and 3.1-1, 059c, are identified as not used or not applicable to the SLRA. For these SLRA table 1 AMR items, the staff confirmed that the analogous and corresponding table 1 AMR items in table 3.1-1 of the SRP-SLR are not applicable to the RVI components at PSL, Units 1 and 2, because the corresponding SRP-SLR items apply only to the RVI components in B&W- or Westinghouse-designed reactors. Thus, the staff concludes that these SLRA table 1 AMR items do not apply to the scope of the SLRA for PSL.

SLRA table 3.1-1, items 3.1-1, 052a; 3.1-1, 052b, 3.1-1, 052c; 3.1-1, 053b; 3.1-1, 053c; 3.1-1, 055b; 3.1-1, 056a; 3.1-1, 056b; 3.1-1, 058b; 3.1-1, 056c; 3.1-1, 118; and 3.1-1, 119, are identified as consistent with the AMR items in SRP-SLR table 3.1-1. The staff found these table 1 AMR items to be acceptable, because it confirmed that they are consistent with the corresponding AMR items for specific RVI component groups in SRP-SLR table 3.1-1, as updated in SLR-ISG-2021-01-PWRVI. The staff also found the corresponding table 2-based AMR items in SLRA table 3.1-2 for specified RVI components cross-referenced to the table 1 AMR items (as updated, including changes made to the SLRA table 2 AMR items, in the applicant's letter of April 7, 2022) to be acceptable, because the staff confirmed that these items are consistent with the corresponding AMR items for the components in GALL-SLR table IV.B4, as updated in SLR-ISG-2021-01-PWRVI.

In its letter dated April 7, 2022, the applicant made the following amendments to the AMR items for RVI components in SLRA table 3.1.2-2, "Reactor Vessel Internals—Summary of Aging Management Evaluation":

- Amended the AMR item (SLRA page 3.1-59, as cross-linked to GALL-SLR AMR item IV.B3.R-424 and SLRA table 3.1-1, item 3.1-1, 119) to add loss of fracture toughness and loss of preload as additional noncracking effects for the core shroud tie rods in the RVI design (i.e., in addition to loss of material and changes in dimension).

- Amended the AMR item (SLRA page 3.1-61, as cross-linked to GALL-SLR AMR item IV.B3.R-424 and SLRA table 3.1-1, item 3.1-1, 119) on management of changes in dimension and loss of material in the core support plates; added footnote 3 for this line item, which states, "Per Appendix C, the newly screened in aging effects are managed by the Reactor Vessel Internals Program."

- Amended the AMR item (SLRA page 3.1-62, as cross-linked to GALL-SLR AMR item IV.B3.R-424 and SLRA table 3.1-1, item 3.1-1, 119) to delete changes in dimension as a cited noncracking effect and to add loss of fracture toughness as an additional noncracking effect for the fuel alignment plates in the RVI design (i.e., in addition to loss of material as a cited noncracking effect for the fuel alignment plates).

The staff found the changes to these SLRA table 3.1.2-2 AMR items to be acceptable, because it determined the items to be consistent with the corresponding GALL-SLR AMR items for the specified components, as updated in SLR-ISG-2021-01-PWRVI.

In its letter of June 13, 2022, the applicant made the following amendments to the AMR items for RVI components in SLRA table 3.1.2-2:

- Added an AMR item (SLRA page 3.1-61, as cross-linked to GALL-SLR AMR item IV.B3.R-423 and SLRA table 3.1-1, item 3.1-1, 118) on management of changes in the core support barrel (CSB) expandable plugs and patches (i.e., repair components for PSL Unit 1 only).

- Amended the existing AMR item (SLRA page 3.1-61, as cross-linked to GALL-SLR AMR item IV.B3.R-423 and SLRA table 3.1-1, item 3.1-1, 118) on cracking of the CSB flexure welds to realign the flexure welds as expansion category components for the RVI program, where the AMR item now aligns with SLRA item 3.1-1-052b and with GALL-SLR IV.B3.RP-333 as updated in SLR-ISG-2021-01-PWRVI.

- Deleted the AMR items on cracking, loss of fracture toughness, changes in dimension, and loss of material of the core support plates from the scope of SLRA table 3.1.2-2.

The staff found the new AMR item for the CSB expandable plugs and patches (PSL Unit 1 only) to be acceptable because, as is explained in the applicant's response to RAI B.2.3.7-2 and as discussed and accepted by the staff in SE Section 3.0.3.2.8, the applicant has conservatively added the CSB expandable plugs and patches (PSL Unit 1 only) as additional Unit 1-specific Primary category components for the RVI program, as defined in the gap analysis of SLRA appendix C.

The staff found the amendments of the AMR item for the CSB flexure welds to be acceptable because, as is explained in the applicant's response to RAI B.2.3.7-1, Part 1 and as discussed and accepted by the staff in SE Section 3.0.3.2.8, the applicant has conservatively designated the CSB flexure welds as applicable expansion category components for the Primary category CSB upper flanges welds (UFWs) in the RVI program, as defined in the gap analysis of SLRA appendix C.

The staff found the deletion of the SLRA table 3.1.2-2 component-specific line items for the core support plates to be acceptable because, as is explained in the applicant's response to RAI B.2.3.7-1, Part 2 and as discussed and accepted by the staff in SE Section 3.0.3.2.8, the applicant has provide an adequate basis for placing the core support plates in PSL Units 1 and 2 in as No Additional Measures (NAM) category components for the RVI program, as defined in the gap analysis of SLRA appendix C. In this case, the staff notes that the applicable AMR items for the core support plates are now appropriately addressed by the applicant's generic AMR item for RVI NAM components in SLRA table 3.1-1, item 055b, and the line item for NAM category components in SLRA table 3.1.2-2 that links to SLRA table 3.1-1, item 055b and GALL-SLR, item IV.B3.RP-306.

Thus, based on the review, the staff finds the AMR items for the referenced RVI components in the SLRA (as amended in the letters of April 7, 2022, and June 13, 2022) to be acceptable, because the staff has confirmed that the AMR items are consistent with those for CE-designed RVI components in both the SRP-SLR and the GALL-SLR Report, as updated, including changes to the SRP-SLR and GALL-SLR items, in SLR-ISG-2021-01-PWRVI.

3.1.2.2.10 Loss of Material Due to Wear

Items 1 and 2. SLRA section 3.1.2.2.10, subsection 1, which is associated with SLRA table 3.1-1, AMR items 3.1-1, 116, and 3.1-1, 117, addresses loss of material due to wear in nickel alloy control rod drive mechanism (CRDM; CEM for CE-designed PWRs[2]) penetration nozzles and stainless steel CRDM penetration nozzle thermal sleeves that are included in the design of PWR upper RPV closure heads and exposed to a metal-to-metal surface interfacing environment. Similarly, SLRA section 3.1.2.2.10, subsection 2, which is associated with SLRA table 3.1-1, AMR item 3.1-1, 117, addresses loss of material due to wear in stainless steel CRDM/CEM penetration nozzle thermal sleeves that are included in the design of PWR upper RPV closure heads and exposed to a metal-to-metal surface interfacing environment. The applicant stated that these items are not applicable. The applicant clarified that the relevant AMR further evaluation guidance applies to CRDM penetration nozzles and nozzle thermal sleeves in Westinghouse-designed PWRs, whereas the replacement upper RPV closure heads

2 The equivalent term for a CRDM in CE-designed PWRs is "control element mechanism" (CEM).

in the PSL reactor units were designed by the Framatome Company to conform to the design of the original upper RPV closure heads, which were designed by CE. The staff noted that this clarification supports the applicant's basis that the cited experience in SRP-SLR section 3.1.2.2.10, subsections 1 and 2, is not applicable to the design of the replacement RPV heads at PSL Units 1 and 2.

Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.1.2.2.10, subsections 1 and 2, the staff finds the claim acceptable for three reasons:

(1) The AMR further evaluation criteria for evaluating wear in CRDM/CEM penetration nozzles and nozzle thermal sleeves are applicable only to these components in the upper RPV closure heads of Westinghouse--designed PWRs, whereas the RPV closure heads at the PSL units are of a different design.

(2) The staff is not aware of any similar wear-based operating experience for the CEM penetration nozzles or nozzle thermal sleeves in the replacement RPV closure heads that were designed by Framatome Corporation and placed into service for PSL Units 1 and 2.

(3) The generic operating experience cited in SRP--SLR section 3.1.2.2.10, subsections 1 and 2, is not applicable to the CLB or design basis of the replacement RPV closure heads in the PSL reactor designs.

3.1.2.2.11 Cracking Due to Primary Water Stress Corrosion Cracking

SLRA table 3.1-1, AMR item 3.1-1, 025, addresses cracking due to primary water stress corrosion cracking (PWSCC) for steel (with nickel alloy cladding) or nickel alloy SG primary side components—specifically, divider plate and tube-to-tubesheet welds exposed to reactor coolant. SLRA section 3.1.2.2.11, associated with SLRA table 3.1-1, AMR item 3.1-1, 025, addresses cracking for Alloy 600 material exposed to reactor coolant, which will be managed by the SG and water chemistry programs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.1.2.2.11.

Item 1. The PSL Unit 1 SGs are replacement SGs designed and fabricated by B&W; they have stainless steel floating divider plates. The PSL Unit 2 SGs are Model 86/19TI replacement SGs that were manufactured by AREVA and have Alloy 690 divider plates and associated welds.

The SRP-SLR does not require further evaluation of a plant-specific AMP for stainless steel divider plates. The SRP-SLR states that a plant-specific AMP is not necessary for plants with divider plate assemblies fabricated of Alloy 690 and Alloy-690-type weld materials.

The staff finds that the applicant has met the further evaluation criteria, for two reasons:

(1) Further evaluation for a plant-specific AMP is not required for the PSL Unit 1 stainless steel floating divider plates. (Cracking and loss of material will be managed by the water chemistry program, consistent with the GALL-SLR Report (SLRA Supplement 1, dated April 7, 2002 (ML22097A202).)

(2) The divider plate assemblies for PSL Unit 2 are fabricated of Alloy 690 and Alloy-690-type weld materials (cracking and loss of material will be managed by the SG and water chemistry programs, consistent with the GALL-SLR Report); therefore, a plant-specific AMP is not required.

Based on the programs identified, the staff concludes that the applicant's programs meet the criteria for item 1 in SRP-SLR section 3.1.2.2.11. For the AMR item associated with SLRA section 3.1.2.2.11, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 2. The PSL Unit 1 SGs have thermally treated Alloy 690 tubes, and the tubesheets are clad with Alloy-600-type material. The PSL Unit 2 SGs also have thermally treated Alloy 690 tubes, and the tubesheets are clad with Alloy-690-type material. SLRA section 3.1.2.2.11 states that plant-specific AMPs are not necessary for PSL Unit 1, because the welds have a minimum chromium content of 24.2 percent and the primary face of the tubesheet is in compression, while PSL Unit 2 has thermally treated Alloy 690 SG tubes and the tubesheets are clad with Alloy-690-type material.

The SRP-SLR states that a plant-specific AMP is not necessary for plants with thermally treated Alloy 690 SG tubes and tubesheets clad with Alloy-600-type material if the applicant confirms that the industry's analyses for tube-to-tubesheet weld cracking are applicable and bounding (e.g., chromium content for the tube-to-tubesheet welds is approximately 22 percent and the tubesheet primary face is in compression, as discussed in Electric Power Research Institute (EPRI) 3002002850, "Steam Generator Management Program: Investigation of Crack Initiation and Propagation in the Steam Generator Channel Head Assembly," issued October 2014), and if the applicant will perform general visual inspections of the tubesheet region to look for evidence of cracking. In addition, the SRP-SLR states that a plant-specific AMP is not necessary for plants with thermally treated Alloy 690 SG tubes with tubesheet cladding using Alloy-690-type material.

The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.1.2.2.11, item 2, and finds it acceptable for the PSL Unit 1 SGs, for the following reasons. The applicant evaluated the susceptibility of the tubesheet to crack initiation and determined that the minimum chromium content in the welds is 24.2 percent. As stated in LR-ISG-2016-01, "Changes to Aging Management Guidance for Various Steam Generator Components," dated November 30, 2016 (ML16237A383), in general, nickel alloys with higher chromium content are more resistant to PWSCC, and "the staff is not aware of PWSCC in nickel alloys with chromium contents greater than 22 percent in nuclear power plant applications." The primary face of the tubesheet is in compression, which is consistent with the recommendations in SRP-SLR section 3.1.2.2.11. During the subsequent period of extended operation, the applicant will manage cracking and loss of material of the tube-to-tubesheet welds through the SG and water chemistry programs, consistent with the GALL-SLR Report (SLRA Supplement 1). The staff finds the applicant's claim acceptable for the PSL Unit 2 SGs, because the tubes are of thermally treated Alloy 690 and the tubesheets are clad with Alloy-690-type material.

Based on the programs identified, the staff concludes that the applicant's programs meet the criteria for item 2 in SRP-SLR section 3.1.2.2.11. For the AMR item associated with SLRA section 3.1.2.2.11, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.12 Cracking Due to Irradiation-Assisted Stress Corrosion Cracking

SLRA section 3.1.2.2.12 is associated with SLRA table 3.1-1, items 3.1-1, 029; 3.1-1, 041; and 3.1-1, 103, which address irradiation-assisted SCC for nickel alloy and stainless steel RVI components exposed to the BWR vessel environment. The applicant stated that this item is not applicable. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.1.2.2.12, the staff finds it acceptable, because the applicant's RV design is not a BWR and thus the RVI components are not exposed to a BWR vessel environment.

3.1.2.2.13 Loss of Fracture Toughness Due to Neutron Irradiation or Thermal Aging Embrittlement

SLRA section 3.1.2.2.13 is associated with SLRA table 3.1-1, item 3.1-1, 099, which addresses loss of fracture toughness due to neutron irradiation or thermal aging embrittlement for nickel alloy and stainless steel RVI components exposed to the BWR vessel environment. The applicant stated that this item is not applicable. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.1.2.2.13, the staff finds it acceptable, because the applicant's RV design is not a BWR and thus the RVI components are not exposed to a BWR vessel environment.

3.1.2.2.14 Loss of Preload Due to Thermal or Irradiation-Enhanced Stress Relaxation

SLRA section 3.1.2.2.14 is associated with SLRA table 3.1-1, item 3.1-1, 120, which addresses loss of preload due to thermal or irradiation-enhanced stress relaxation for BWR core plate rim holddown bolts exposed to the BWR vessel environment. The applicant stated that this item is not applicable. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.1.2.2.14, the staff finds it acceptable, because the applicant's RV design is not a BWR and does not use BWR core plate rim holddown bolts.

3.1.2.2.15 Loss of Material Due to General, Crevice, or Pitting Corrosion and Cracking Due to Stress Corrosion Cracking

SLRA section 3.1.2.2.15 is associated with SLRA table 3.1-1, AMR items 3.1-1, 105 and 3.1-1, 115, which address (1) loss of material due to general, crevice, or pitting corrosion for steel piping or piping components exposed to concrete (item 3.1-1, 105), and (2) loss of material due to crevice or pitting corrosion and cracking due to SCC for stainless steel piping and piping components exposed to concrete (item 3.1-1, 115). The applicant stated that there are no RCS steel or stainless steel piping or piping components within the scope of the SLR that are exposed to concrete. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.1.2.2.15, the staff finds its acceptable, because a review of the UFSAR and SLRA confirms that the RCS contains no steel or stainless steel piping or piping components exposed to concrete.

For those AMR items associated with SLRA section 3.1.2.2.15, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.16 Loss of Material Due to Pitting and Crevice Corrosion in Stainless Steel and Nickel Alloys

SLRA section 3.1.2.2.16 is associated with SLRA table 3.1-1, AMR item 3.1-1, 136, which addresses loss of material from pitting and crevice corrosion for stainless steel and nickel alloy piping and piping components exposed to air or condensation, which will be managed by the external surfaces monitoring of mechanical components program. The staff evaluated the applicant's proposal against the criteria in SRP-SLR section 3.1.2.2.16. In the review of components associated with AMR item 3.1-1, 136, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the external surfaces monitoring of mechanical components program is acceptable, because doing so is consistent with the recommendation in SRP-SLR section 3.1.2.2.16.

Based on the program identified, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained, consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.17 Quality Assurance for Aging Management of Non-Safety-Related Components

SE section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.1.2.2.18 Ongoing Review of Operating Experience

SE section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of operating experience.

3.1.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

The SLRA did not identify any AMR results in SLRA tables 3.1.2-1 through 3.1.2-5 that are not consistent with, or not addressed in, the GALL-SLR Report.

3.2 <u>Aging Management of Engineered Safety Features</u>

3.2.1 Summary of Technical Information in the Application

SLRA section 3.2 provides AMR results for those components that the applicant identified in SLRA section 2.3.2, "Engineered Safety Features," as being subject to an AMR. SLRA table 3.2-1, "Summary of Aging Management Evaluations for Engineered Safety Features ," gives a summary comparison of the applicant's AMRs with those evaluated in the GALL-SLR Report for the engineered safety feature components.

3.2.2 Staff Evaluation

Table 3.2-1 summarizes the staff's evaluation of the component groups listed in SLRA section 3.2 and addressed in the GALL-SLR Report.

Table 3.2-1 Staff Evaluation for Engineered Safety Features Components in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2-1, 001	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.1)
3.2-1, 002	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 003	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 004	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.2)
3.2-1, 005	Not applicable to PSL
3.2-1, 006	Not applicable to PWRs
3.2-1, 007	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.4)
3.2-1, 008	Consistent with the GALL-SLR Report
3.2-1, 009	Consistent with the GALL-SLR Report
3.2-1, 010	Consistent with the GALL-SLR Report
3.2-1, 011	Not applicable to PSL
3.2-1, 012	Not applicable to PSL
3.2-1, 013	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 014	Consistent with the GALL-SLR Report
3.2-1, 015	Consistent with the GALL-SLR Report
3.2-1, 016	Not used
3.2-1, 017	Consistent with the GALL-SLR Report
3.2-1, 018	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 019	Consistent with the GALL-SLR Report
3.2-1, 020	Consistent with the GALL-SLR Report
3.2-1, 021	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 022	Consistent with the GALL-SLR Report
3.2-1, 023	Not applicable to PSL
3.2-1, 024	Not applicable to PSL
3.2-1, 025	Not applicable to PSL
3.2-1, 026	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 027	Not applicable to PSL
3.2-1, 028	Not applicable to PSL
3.2-1, 029	Not applicable to PSL
3.2-1, 030	Consistent with the GALL-SLR Report
3.2-1, 031	Consistent with the GALL-SLR Report
3.2-1, 032	Consistent with the GALL-SLR Report
3.2-1, 033	Consistent with the GALL-SLR Report
3.2-1, 034	Consistent with the GALL-SLR Report
3.2-1, 035	Consistent with the GALL-SLR Report
3.2-1, 036	Not applicable to PSL
3.2-1, 037	Not applicable to PSL
3.2-1, 038	Consistent with the GALL-SLR Report
3.2-1, 039	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 040	Consistent with the GALL-SLR Report
3.2-1, 041	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 042	Not used. Addressed by 3.2-1, 105 (see SE section 3.2.2.2.10)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2-1, 043	Consistent with the GALL-SLR Report
3.2-1, 044	Consistent with the GALL-SLR Report
3.2-1, 045	Not applicable to PSL
3.2-1, 046	Not used. Addressed by 3.2-1, 044
3.2-1, 047	Not applicable to PSL
3.2-1, 048	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.2)
3.2-1, 049	Not applicable to PSL
3.2-1, 050	Not applicable to PSL
3.2-1, 051	Not applicable to PSL
3.2-1, 052	Not applicable to PSL
3.2-1, 053	Not applicable to PSL
3.2-1, 054	Not applicable to PWRs
3.2-1, 055	Not applicable to PSL (see SE section 3.2.2.2.9)
3.2-1, 056	Not used. Addressed by 3.2-1, 105 (see SE section 3.2.2.2.10)
3.2-1, 057	Consistent with the GALL-SLR Report
3.2-1, 058	Not applicable to PSL
3.2-1, 059	Consistent with the GALL-SLR Report
3.2-1, 060	Consistent with the GALL-SLR Report
3.2-1, 061	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 062	Not used
3.2-1, 063	Consistent with the GALL-SLR Report
3.2-1, 064	Not applicable to PSL
3.2-1, 065	Not applicable to PSL
3.2-1, 066	Not applicable to PSL (see SE section 3.2.2.2.7)
3.2-1, 067	Consistent with the GALL-SLR Report
3.2-1, 068	Not applicable to PSL
3.2-1, 069	Not applicable to PSL
3.2-1, 070	Consistent with the GALL-SLR Report
3.2-1, 071	Not applicable to PSL
3.2-1, 072	Consistent with the GALL-SLR Report
3.2-1, 073	Not used
3.2-1, 074	Not applicable to PSL
3.2-1, 075	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 076	Not applicable to PSL
3.2-1, 077	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 078	Not used. Addressed by 3.2-1, 067.
3.2-1, 079	Consistent with the GALL-SLR Report
3.2-1, 080	Not applicable to PSL (see SE section 3.2.2.2.4)
3.2-1, 081	Consistent with the GALL-SLR Report
3.2-1, 082	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 083	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 084	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 085	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 086	This item number is not used in the SRP-SLR or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2-1, 087	Consistent with the GALL-SLR Report
3.2-1, 088	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 089	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 090	Not applicable to PSL
3.2-1, 091	Not applicable to PSL (see SE section 3.2.2.2.9)
3.2-1, 092	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 093	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 094	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 095	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 096	Not applicable to PSL
3.2-1, 097	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 098	Not applicable to PSL
3.2-1, 099	Not used. Addressed by 3.2-1, 004 and 3.2-1, 106 (see SE section 3.2.2.2.2)
3.2-1, 100	Not used. Addressed by 3.2-1, 102 (see SE section 3.2.2.2.8)
3.2-1, 101	Not used. Addressed by 3.2-1, 102 (see SE section 3.2.2.2.8)
3.2-1, 102	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.8)
3.2-1, 103	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.4)
3.2-1, 104	Not applicable to PSL
3.2-1, 105	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.10)
3.2-1, 106	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.2)
3.2-1, 107	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.2)
3.2-1, 108	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.4)
3.2-1, 109	Not applicable to PSL (see SE section 3.2.2.2.8)
3.2-1, 110	Not applicable to PSL (see SE section 3.2.2.2.8)
3.2-1, 111	Not applicable to PSL (see SE section 3.2.2.2.10)
3.2-1, 112	Not applicable to PSL (see SE section 3.2.2.2.2)
3.2-1, 113	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 114	Not applicable to PSL
3.2-1, 115	Not applicable to PSL
3.2-1, 116	Not applicable to PSL
3.2-1, 117	Not applicable to PSL
3.2-1, 118	Not applicable to PSL
3.2-1, 119	Not applicable to PSL (see SE section 3.2.2.2.10)
3.2-1, 120	Not used
3.2-1, 121	Not applicable to PSL (see SE section 3.2.2.2.10)
3.2-1, 122	Consistent with the GALL-SLR Report
3.2-1, 123	Consistent with the GALL-SLR Report
3.2-1, 124	Not used
3.2-1, 125	Not applicable to PSL
3.2-1, 126	Not applicable to PSL
3.2-1, 127	Not applicable to PSL
3.2-1, 128	Not applicable to PSL
3.2-1, 129	Consistent with the GALL-SLR Report
3.2-1, 130	Not applicable to PSL

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2-1, 131	Not applicable to PSL
3.2-1, 132	Not applicable to PSL
3.2-1, 133	Not applicable to PSL
3.2-1, 134	Not applicable to PSL

The following three sections summarize the staff's review of component groups, as described in SE section 3.0.2.2:

(1) SE section 3.2.2.1 discusses AMR results for components that the applicant stated either are not applicable to PSL or are consistent with the GALL-SLR Report. Section 3.2.2.1.1 summarizes the staff's review of items that are not applicable or not used and documents any RAIs issued and the staff's conclusions. The remaining subsections in SE section 3.2.2.1 document the review of components that required additional information or otherwise required explanation.

(2) SE section 3.2.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

(3) SE section 3.2.2.3 discusses AMR results for components that the applicant stated are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the SLRA.

3.2.2.1 Aging Management Review Results Consistent with the GALL-SLR Report

The following subsections document the staff's review of those AMR results listed in SLRA tables 3.2.2-1 through 3.2.2-5 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat the review of the matters described in the GALL-SLR Report; however, the staff did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-SLR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions, as documented in the GALL-SLR Report, are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SE table 3.2-1, and no separate writeup is required or provided. For the AMR items that required additional evaluation (such as responses to RAIs), the staff documents the evaluation in section 3.2.2.1.2.

SE section 3.2.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable or not used.

3.2.2.1.1 Aging Management Review Results Identified as Not Applicable or Not Used

For SLRA table 3.2-1, items 3.2-1, 005; 3.2-1, 011; 3.2-1, 012; 3.2-1, 016; 3.2-1, 023; 3.2-1, 024; 3.2-1, 025; 3.2-1, 027; 3.2-1, 028; 3.2-1, 029; 3.2-1, 036; 3.2-1, 037; 3.2-1, 042; 3.2-1, 045; 3.2-1, 046; 3.2-1, 047; 3.2-1, 049, through 3.2-1, 053; 3.2-1, 055; 3.2-1, 056; 3.2-1, 058; 3.2-1, 062; 3.2-1, 064; 3.2-1, 065; 3.2-1, 066; 3.2-1, 068; 3.2-1, 069; 3.2-1, 071; 3.2-1, 073; 3.2-1, 074; 3.2-1, 076; 3.2-1, 078; 3.2-1, 080; 3.2-1, 090; 3.2-1, 091; 3.2-1, 096; 3.2-1, 098, through 3.2-1, 101; 3.2-1, 104; 3.2-1, 109, through 3.2-1, 112; 3.2-1, 114, through 3.2-1, 121; 3.2-1, 124, through 3.2-1, 128; and 3.2-1, 130, through 3.2-1, 134, the applicant claimed that the corresponding AMR items in the GALL-SLR Report are not applicable to PSL. The staff reviewed the SLRA, the description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents, and confirmed that the applicant's SLRA does not have any AMR results that are applicable to these items.

For SLRA table 3.2-1, items 3.2-1, 006, and 3.2-1, 054, the applicant claimed that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items apply only to BWRs. The staff reviewed the SRP-SLR, confirmed that these items apply only to BWRs, and finds that these items are not applicable to PSL, because it is a PWR.

3.2.2.2 Aging Management Review Results for Which Further Evaluation is Recommended by the GALL Report

In SLRA section 3.2.2.2, the applicant further evaluated aging management for the engineered safety feature components, as recommended by the GALL-SLR Report, and explained how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria in SRP-SLR section 3.2.2.2. The following subsections document the staff's review.

3.2.2.2.1 Cumulative Fatigue Damage

SLRA section 3.2.2.2.1 is associated with SLRA table 3.2-1, item 001, which states that the TLAA on cumulative fatigue damage in the components of engineered safety features is evaluated in accordance with 10 CFR 54.21(c)(1) and addressed in SLRA section 4.3.2. The applicant's evaluation of the TLAA is consistent with SRP-SLR section 3.2.2.2.1 and is, therefore, acceptable. SE section 4.3.2 documents the staff's evaluation of the TLAA for the components of engineered safety features.

3.2.2.2.2 Loss of Material Due to Pitting and Crevice Corrosion in Stainless Steel and Nickel Alloys

SLRA section 3.2.2.2.2 is associated with SLRA table 3.2-1, AMR items 3.2-1, 004, 3.2-1, 048, 3.2-1, 106, and 3.2-1, 107, which address loss of material due to pitting and crevice corrosion for stainless steel and nickel alloy piping, piping components, and tanks; stainless steel tanks within the scope of GALL-SLR AMP XI.M29; and insulated stainless steel piping, piping components, and tanks exposed internally or externally to air or condensation, which will be managed by the outdoor and large atmospheric metallic storage tanks, external surfaces monitoring of mechanical components, and inspection of internal surfaces in miscellaneous piping and ducting components programs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.2.2.2.2.

In the review of components associated with AMR items 3.2-1, 004, 3.2-1, 048, 3.2-1, 106, and 3.2-1, 107, the staff finds that the applicant has met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the outdoor and large atmospheric metallic storage tanks, external surfaces monitoring of mechanical components, and inspection of internal surfaces in miscellaneous piping and ducting components programs is acceptable, because the periodic inspections conducted as part of these programs are capable of detecting whether loss of material is occurring.

SLRA section 3.2.2.2.2 is also associated with SLRA table 3.2-1, AMR item 3.2-1, 099, which addresses loss of material due to pitting and crevice corrosion for stainless steel or nickel alloy tanks exposed to air or condensation. The applicant stated this item is not used because these components are addressed using different AMR items. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.2.2.2.2 and finds it acceptable. This is based on the applicant's proposal to use AMR item 3.2-1, 004 with the external surfaces monitoring of mechanical components program, which includes periodic inspections capable of detecting whether loss of material is occurring, to manage stainless steel or nickel alloy tanks exposed externally to air or condensation. It is also based on the applicant's proposal to use AMR item 3.2-1, 106 with the outdoor and large atmospheric metallic storage tanks program, which includes periodic inspections capable of detecting whether loss of material is occurring, to manage loss of material due to pitting or crevice corrosion for tanks within the scope of GALL-SLR AMP XI.M29 that are exposed to air or condensation.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.2.2.2.2 criteria. For those AMR items associated with SLRA section 3.2.2.2.2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.2.2.2.2 is also associated with SLRA table 3.2-1, AMR item 3.2-1, 112, which addresses loss of material due to pitting and crevice corrosion for stainless steel underground piping, piping components, and tanks. The applicant stated that this item is not applicable. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.2.2.2.2, the staff finds it acceptable, because a review of the UFSAR and SLRA confirms that the engineered safety feature systems contain no stainless steel or nickel alloy underground piping, piping components, or tanks.

3.2.2.2.3 Loss of Material Due to General Corrosion and Flow Blockage Due to Fouling

SLRA section 3.2.2.2.3 is associated with SLRA table 3.2-1, item 3.2-1, 006, which addresses loss of material due to general, pitting, and crevice corrosion, as well as flow blockage due to fouling, in the metallic drywell and suppression chamber spray system (internal surfaces), flow orifices, and spray nozzles exposed to uncontrolled indoor air or condensation. The applicant stated that this item is not applicable because it applies only to BWRs. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.2.2.2.3 and finds it acceptable, because, as stated in the SRP-SLR, metallic flow orifices and spray nozzles are located in the drywell and suppression chamber spray system, which are found only in BWR plants and makes it not applicable to PSL.

3.2.2.2.4 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

SLRA section 3.2.2.2.4 is associated with SLRA table 3.2-1, AMR items 3.2-1, 007, 3.2-1, 103, and 3.2-1, 108, which address cracking due to SCC for stainless steel piping, piping components, and tanks; stainless steel tanks within the scope of GALL-SLR AMP XI.M29; and insulated stainless steel piping, piping components, and tanks exposed to air or condensation, which will be managed by the outdoor and large atmospheric metallic storage tanks, external surfaces monitoring of mechanical components, and inspection of internal surfaces in miscellaneous piping and ducting components programs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.2.2.2.4.

In the review of components associated with AMR items 3.2-1, 007, 3.2-1, 103, and 3.2-1, 108, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the outdoor and large atmospheric metallic storage tanks, external surfaces monitoring of mechanical components, and inspection of internal surfaces in miscellaneous piping and ducting components programs is acceptable, because the periodic inspections conducted as part of these programs are capable of detecting whether cracking is occurring.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.2.2.2.4 criteria. For those AMR items associated with SLRA section 3.2.2.2.4, the staff concludes that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.2.2.2.4 is also associated with SLRA table 3.2-1, AMR item 3.2-1, 080, which addresses cracking due to SCC for stainless steel underground piping, piping components, and tanks. The applicant stated that this item is not applicable. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.2.2.2.4, the staff finds it acceptable, because a review of the UFSAR and SLRA confirms that the engineered safety feature systems contain no stainless steel underground piping, piping components, or tanks.

3.2.2.2.5 Quality Assurance for Aging Management of Nonsafety-Related Components

SE section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.2.2.2.6 Ongoing Review of Operating Experience

SE section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of operating experience.

3.2.2.2.7 Loss of Material Due to Recurring Internal Corrosion

SLRA section 3.2.2.2.7 is associated with SLRA table 3.2-1, item 3.2-1, 066 and addresses loss of material due to recurring internal corrosion in metallic piping components exposed to several water environments. The SLRA states that operating experience over the past 10 years did not show instances that met the criteria of recurring internal corrosion in the engineered safety features systems. Consequently, recurring internal corrosion is not an applicable aging effect at the site. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.2.2.2.7 and finds it is acceptable because the staff also did not identify any instances of recurring internal corrosion in engineering safety features systems during the review of the operating experience documentation provided as part of the audit.

3.2.2.2.8 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA section 3.2.2.2.8 is associated with SLRA table 3.2-1, AMR item 3.2-1, 102, which addresses cracking due to SCC for aluminum tanks within the scope of GALL-SLR AMP XI.M29 that are exposed to air, condensation, soil, concrete, raw water, or wastewater, which will be managed by the outdoor and large atmospheric metallic storage tanks program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.2.2.2.8.

In the review of components associated with AMR item 3.2-1, 102, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the outdoor and large atmospheric metallic storage tanks program is acceptable, because the periodic inspections conducted as part of this program are capable of detecting whether cracking is occurring.

SLRA section 3.2.2.2.8 is also associated with SLRA table 3.2-1, AMR items 3.2-1, 100 and 3.2-1, 101, which address cracking due to SCC for aluminum piping, piping components, and tanks exposed to air, condensation (internal or external), raw water, or wastewater. The applicant stated that these items are not used because the engineered safety feature systems contain no aluminum piping, piping components, or tanks exposed to raw water or wastewater, and no aluminum piping or piping components exposed to air. For aluminum tanks in the engineered safety feature systems that are exposed to air, the applicant proposed to manage cracking due to SCC using AMR item 3.2-1, 102 with the outdoor and large atmospheric metallic storage tanks program. As stated in the preceding paragraph, the staff finds that the applicant's proposal to manage SCC for aluminum tanks exposed to air using AMR item 3.2-1, 102 is acceptable. In addition, based on a review of the UFSAR and SLRA, the staff has confirmed that the engineered safety feature systems contain no aluminum piping, piping components, or tanks exposed to raw water or wastewater, and no aluminum piping or piping components exposed to air.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.2.2.2.8 criteria. For those AMR items associated with SLRA section 3.2.2.2.8, the staff concludes that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.2.2.2.8 is also associated with SLRA table 3.2-1, AMR items 3.2-1, 109 and 3.2-1, 110, which address cracking due to SCC for insulated aluminum piping, piping components, and tanks exposed to air or condensation, and for underground aluminum piping, piping components, and tanks. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.2.2.2.8 and finds it acceptable, because a review of the UFSAR and SLRA confirms that the engineered safety feature systems contain no in-scope insulated aluminum piping, piping components, or tanks exposed to air or condensation, and no aluminum underground piping, piping components, or tanks.

3.2.2.2.9 Loss of Material Due to General, Crevice, or Pitting Corrosion and Cracking Due to Stress Corrosion Cracking

SLRA section 3.2.2.2.9 is associated with SLRA table 3.2-1, AMR items 3.2-1, 055 and 3.2-1, 091, which address (1) loss of material due to general, crevice, or pitting corrosion in steel piping and piping components exposed to concrete (item 3.2-1, 055), and (2) loss of material due to crevice or pitting corrosion and cracking due to SCC in stainless steel piping and piping components exposed to concrete (item 3.2-1, 091). The applicant stated that the engineered safety feature systems contain no steel or stainless steel piping or piping components exposed to concrete. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.2.2.2.9, the staff finds it acceptable, because a review of the UFSAR and SLRA confirms that the engineered safety feature systems contain no steel or stainless steel piping or piping components exposed to concrete.

For those AMR items associated with SLRA section 3.2.2.2.9, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.10 Loss of Material Due to Pitting and Crevice Corrosion in Aluminum Alloys

SLRA section 3.2.2.2.10 is associated with SLRA table 3.2-1, AMR item 3.2-1, 105, which addresses loss of material due to pitting or crevice corrosion for aluminum tanks within the scope of GALL-SLR AMP XI.M29 that are exposed to air or condensation, which will be managed by the outdoor and large atmospheric metallic storage tanks program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.2.2.2.10.

In the review of components associated with AMR item 3.2-1, 105, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging for AMR item 3.2-1, 105 using the outdoor and large atmospheric storage tanks program is acceptable, because the periodic inspections conducted as part of this program are capable of detecting whether loss of material is occurring.

SLRA section 3.2.2.2.10 is also associated with SLRA table 3.2-1, AMR items 3.2-1, 042 and 3.2-1, 056, which address loss of material due to pitting or crevice corrosion for aluminum piping, piping components, and tanks exposed externally or internally to air or condensation. The applicant stated that these items are not used, because the only aluminum component exposed to air or condensation in the engineered safety feature systems is the Unit 1 refueling water tank, which is managed using AMR item 3.2-1, 105. As stated in the preceding paragraph, the staff finds that the applicant's proposal to manage pitting and crevice corrosion for aluminum tanks exposed to air using AMR item 3.2-1, 105 is acceptable. In addition, based on a review of the UFSAR and SLRA, the engineered safety feature systems contain no other aluminum piping, piping components, or tanks exposed to air.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.2.2.2.10 criteria. For those AMR items associated with SLRA section 3.2.2.2.10, the staff concludes that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.2.2.2.10 is also associated with SLRA table 3.2-1, AMR items 3.2-1, 111, 3.2-1, 119, and 3.2-1, 121, which address loss of material due to pitting or crevice corrosion for underground aluminum piping, piping components, and tanks; insulated aluminum piping, piping components, and tanks exposed to air or condensation; and aluminum piping, piping components, and tanks exposed to raw water or wastewater. The applicant stated that these items are not applicable. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.2.2.2.10, the staff finds it acceptable, because a review of the UFSAR and SLRA confirms that the engineered safety feature systems contain no in-scope underground aluminum piping, piping components, or tanks; insulated aluminum piping, piping components, or tanks exposed to air or condensation; or aluminum piping, piping components, or tanks exposed to raw water or wastewater.

3.2.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

The SLRA did not identify any AMR results in SLRA tables 3.2.2-1 through 3.2.2-4 that are not consistent with, or not addressed in, the GALL-SLR Report.

3.3 <u>Aging Management of Auxiliary Systems</u>

3.3.1 Summary of Technical Information in the Application

SLRA section 3.3 provides AMR results for those components that the applicant identified in SLRA section 2.3.3, "Auxiliary Systems," as being subject to an AMR. SLRA table 3.3-1, "Summary of Aging Management Evaluations for the Auxiliary Systems," gives a summary comparison of PSL's AMRs with those evaluated in the GALL-SLR Report for the auxiliary system components.

3.3.2 Staff Evaluation

Table 3.3-1 summarizes the staff's evaluation of the component groups listed in SLRA section 3.3 and addressed in the GALL-SLR Report.

Table 3.3-1 Staff Evaluation for Auxiliary Systems Components in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1, 001	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.1)
3.3-1, 002	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.1)
3.3-1, 003	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.2)
3.3-1, 003a	Not used. Addressed by 3.3-1, 003 (see SE section 3.3.2.2.2)
3.3-1, 004	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.3)
3.3-1, 005	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 006	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.4)
3.3-1, 007	Not used
3.3-1, 008	Not used. Addressed by 3.3-1, 003, and 3.3-1, 020
3.3-1, 009	Consistent with the GALL-SLR Report
3.3-1, 010	Not applicable to PSL
3.3-1, 011	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 012	Consistent with the GALL-SLR Report
3.3-1, 013	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 014	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 015	Consistent with the GALL-SLR Report
3.3-1, 016	Not applicable to PWRs
3.3-1, 017	Consistent with the GALL-SLR Report
3.3-1, 018	Not used. Addressed by 3.3-1, 028, and 3.3-1, 124
3.3-1, 019	Not applicable to PWRs
3.3-1, 020	Consistent with the GALL-SLR Report
3.3-1, 021	Not applicable to PWRs
3.3-1, 022	Not applicable to PWRs

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1, 023	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 024	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 025	Not applicable to PSL
3.3-1, 026	Not applicable to PWRs
3.3-1, 027	Not applicable to PWRs
3.3-1, 028	Consistent with the GALL-SLR Report
3.3-1, 029	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 030	Not applicable to PSL
3.3-1, 030a	Consistent with the GALL-SLR Report
3.3-1, 031	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 032	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 032a	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 033	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 034	Consistent with the GALL-SLR Report
3.3-1, 035	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 036	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 037	Consistent with the GALL-SLR Report
3.3-1, 038	Consistent with the GALL-SLR Report
3.3-1, 039	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 040	Consistent with the GALL-SLR Report
3.3-1, 041	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 042	Consistent with the GALL-SLR Report
3.3-1, 043	Not applicable to PSL
3.3-1, 044	Not applicable to PSL
3.3-1, 045	Consistent with the GALL-SLR Report
3.3-1, 046	Consistent with the GALL-SLR Report
3.3-1, 047	Not applicable to PWRs
3.3-1, 048	Not applicable to PSL
3.3-1, 049	Consistent with the GALL-SLR Report
3.3-1, 050	Consistent with the GALL-SLR Report
3.3-1, 051	Not applicable to PSL
3.3-1, 052	Consistent with the GALL-SLR Report
3.3-1, 053	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 054	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 055	Not applicable to PSL
3.3-1, 056	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 057	Consistent with the GALL-SLR Report
3.3-1, 058	Consistent with the GALL-SLR Report
3.3-1, 059	Consistent with the GALL-SLR Report
3.3-1, 060	Not applicable to PSL
3.3-1, 061	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 062	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 063	Consistent with the GALL-SLR Report
3.3-1, 064	Consistent with the GALL-SLR Report (see SE section 3.3.2.1.2)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1, 065	Not applicable to PSL
3.3-1, 066	Consistent with the GALL-SLR Report
3.3-1, 067	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 068	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 069	Consistent with the GALL-SLR Report
3.3-1, 070	Consistent with the GALL-SLR Report
3.3-1, 071	Consistent with the GALL-SLR Report
3.3-1, 072	Consistent with the GALL-SLR Report
3.3-1, 073	Not applicable to PSL
3.3-1, 074	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 075	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 076	Consistent with the GALL-SLR Report
3.3-1, 077	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 078	Consistent with the GALL-SLR Report
3.3-1, 079	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 080	Consistent with the GALL-SLR Report
3.3-1, 081	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 082	Consistent with the GALL-SLR Report
3.3-1, 083	Consistent with the GALL-SLR Report
3.3-1, 084	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 085	Consistent with the GALL-SLR Report
3.3-1, 086	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 087	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 088	Consistent with the GALL-SLR Report
3.3-1, 089	Not applicable to PSL
3.3-1, 090	Not applicable to PSL
3.3-1, 091	Consistent with the GALL-SLR Report
3.3-1, 092	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 093	Not applicable to PSL
3.3-1, 094	Not applicable to PSL (see SE section 3.3.2.2.4)
3.3-1, 094a	Not applicable to PSL (see SE section 3.3.2.2.3)
3.3-1, 095	Consistent with the GALL-SLR Report
3.3-1, 096	Consistent with the GALL-SLR Report
3.3-1, 096a	Consistent with the GALL-SLR Report
3.3-1, 096b	Not applicable to PSL
3.3-1, 097	Consistent with the GALL-SLR Report
3.3-1, 098	Consistent with the GALL-SLR Report
3.3-1, 099	Consistent with the GALL-SLR Report
3.3-1, 100	Consistent with the GALL-SLR Report
3.3-1, 101	Not applicable to PSL
3.3-1, 102	Consistent with the GALL-SLR Report
3.3-1, 103	Not applicable to PSL
3.3-1, 104	Not applicable to PSL
3.3-1, 105	This item number is not used in the SRP-SLR or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1, 106	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 107	Consistent with the GALL-SLR Report
3.3-1, 108	Consistent with the GALL-SLR Report
3.3-1, 109	Consistent with the GALL-SLR Report
3.3-1, 109a	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 110	Not applicable to PWRs
3.3-1, 111	Not used.
3.3-1, 112	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.9)
3.3-1, 113	Not applicable to PSL
3.3-1, 114	Consistent with the GALL-SLR Report
3.3-1, 115	Not used
3.3-1, 116	Consistent with the GALL-SLR Report
3.3-1, 117	Consistent with the GALL-SLR Report
3.3-1, 118	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 119	Consistent with the GALL-SLR Report
3.3-1, 120	Consistent with the GALL-SLR Report
3.3-1, 121	Consistent with the GALL-SLR Report
3.3-1, 122	Not applicable to PSL
3.3-1, 123	Not applicable to PSL
3.3-1, 124	Consistent with the GALL-SLR Report
3.3-1, 125	Consistent with the GALL-SLR Report
3.3-1, 126	Consistent with the GALL-SLR Report
3.3-1, 127	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.7)
3.3-1, 128	Consistent with the GALL-SLR Report
3.3-1, 129	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 130	Consistent with the GALL-SLR Report
3.3-1, 131	Consistent with the GALL-SLR Report
3.3-1, 132	Consistent with the GALL-SLR Report
3.3-1, 133	Not applicable to PSL
3.3-1, 134	Consistent with the GALL-SLR Report
3.3-1, 135	Consistent with the GALL-SLR Report
3.3-1, 136	Consistent with the GALL-SLR Report
3.3-1, 137	Consistent with the GALL-SLR Report
3.3-1, 138	Consistent with the GALL-SLR Report
3.3-1, 139	Not used
3.3-1, 140	Not used
3.3-1, 141	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 142	Consistent with the GALL-SLR Report
3.3-1, 143	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 144	Consistent with the GALL-SLR Report
3.3-1, 145	Consistent with the GALL-SLR Report
3.3-1, 146	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.3)
3.3-1, 147	Not applicable to PSL
3.3-1, 148	This item number is not used in the SRP-SLR or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1, 149	Not applicable to PSL
3.3-1, 150	Consistent with the GALL-SLR Report
3.3-1, 151	Consistent with the GALL-SLR Report
3.3-1, 152	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 153	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 154	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 155	Not applicable to PSL
3.3-1, 156	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 157	Not used
3.3-1, 158	Not used
3.3-1, 159	Consistent with the GALL-SLR Report
3.3-1, 160	Consistent with the GALL-SLR Report
3.3-1, 161	Not used
3.3-1, 162	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 163	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 164	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 165	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 166	Not applicable to PSL
3.3-1, 167	Not applicable to PSL
3.3-1, 168	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 169	Not applicable to PSL
3.3-1, 170	Not applicable to PSL
3.3-1, 171	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 172	Not applicable to PSL
3.3-1, 173	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 174	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 175	Consistent with the GALL-SLR Report
3.3-1, 176	Consistent with the GALL-SLR Report
3.3-1, 177	Not applicable to PSL
3.3-1, 178	Not applicable to PSL
3.3-1, 179	Not applicable to PSL
3.3-1, 180	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 181	Not applicable to PSL
3.3-1, 182	Not used. Addressed by 3.2-1, 087
3.3-1, 183	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 184	Consistent with the GALL-SLR Report
3.3-1, 185	Not applicable to PSL
3.3-1, 186	Not applicable to PSL (see SE section 3.3.2.2.8)
3.3-1, 187	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 188	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 189	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.8)
3.3-1, 190	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 191	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 192	Not applicable to PSL (see SE section 3.3.2.2.8)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1, 193	Consistent with the GALL-SLR Report
3.3-1, 194	Not applicable to PSL
3.3-1, 195	Not applicable to PSL
3.3-1, 196	Not applicable to PSL
3.3-1, 197	Not used
3.3-1, 198	Not used
3.3-1, 199	Consistent with the GALL-SLR Report
3.3-1, 200	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 201	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 202	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.9)
3.3-1, 203	Not applicable to PWRs
3.3-1, 204	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 205	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.3)
3.3-1, 206	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 207	Not applicable to PSL
3.3-1, 208	Not applicable to PSL
3.3-1, 209	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 210	Not applicable to PSL
3.3-1, 211	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 212	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 213	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 214	Not applicable to PSL
3.3-1, 215	Not applicable to PSL
3.3-1, 216	Not applicable to PSL
3.3-1, 217	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 218	Not applicable to PSL
3.3-1, 219	Not applicable to PSL
3.3-1, 220	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 221	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 222	Not used. Addressed by 3.3-1, 006, and 3.3-1, 232 (see SE section 3.3.2.2.4)
3.3-1, 223	Not applicable to PSL (see SE section 3.3.2.2.10)
3.3-1, 224	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 225	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 226	Not applicable to PSL
3.3-1, 227	Not applicable to PSL (see SE section 3.3.2.2.10)
3.3-1, 228	Not applicable to PSL (see SE section 3.3.2.2.4)
3.3-1, 229	Not applicable to PSL
3.3-1, 230	Not applicable to PSL
3.3-1, 231	Not applicable to PSL (see SE section 3.3.2.2.3)
3.3-1, 232	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.4)
3.3-1, 233	Not applicable to PSL (see SE section 3.3.2.2.8)
3.3-1, 234	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.10)
3.3-1, 235	Consistent with the GALL-SLR Report
3.3-1, 236	Not applicable to PSL

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1, 237	Not applicable to PSL
3.3-1, 238	Not applicable to PSL
3.3-1, 239	Not applicable to PSL
3.3-1, 240	Not applicable to PSL (see SE section 3.3.2.2.10)
3.3-1, 241	Not used. Addressed by 3.3-1, 006, and 3.3-1, 232 (see SE section 3.3.2.2.4)
3.3-1, 242	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.10)
3.3-1, 243	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 244	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 245	Not applicable to PSL (see SE section 3.3.2.2.10)
3.3-1, 246	Consistent with the GALL-SLR Report (see SE section 3.3.2.2.4)
3.3-1, 247	Not applicable to PSL (see SE section 3.3.2.2.10)
3.3-1, 248	Not used
3.3-1, 249	Consistent with the GALL-SLR Report
3.3-1, 250	Not used
3.3-1, 251	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 252	Not applicable to PSL
3.3-1, 253	Not applicable to PSL
3.3-1, 254	Not used (see SE section 3.3.2.2.8)
3.3-1, 255	Consistent with the GALL-SLR Report
3.3-1, 256	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 257	Consistent with the GALL-SLR Report
3.3-1, 258	Not applicable to PSL
3.3-1, 259	Not applicable to PSL
3.3-1, 260	Consistent with the GALL-SLR Report
3.3-1, 261	Not applicable to PSL
3.3-1, 262	Not applicable to PSL
3.3-1, 263	Consistent with the GALL-SLR Report
3.3-1, 264	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 265	Not applicable to PSL
3.3-1, 266	Not applicable to PSL
3.3-1, 267	Consistent with the GALL-SLR Report
3.3-1, 268	Consistent with the GALL-SLR Report
3.3-1, 269	Consistent with the GALL-SLR Report

The following three sections summarize the staff's review of component groups, as described in SE section 3.0.2.2:

(1) SE section 3.3.2.1 discusses AMR results for components that the applicant stated either are not applicable to PSL or are consistent with the GALL-SLR Report. Section 3.3.2.1.1 summarizes the staff's review of items that are not applicable or not used and documents any RAIs issued and the staff's conclusions. The remaining subsections in SE sections 3.3.2.1 document the review of components that required additional information or otherwise required explanation.

(2) SE section 3.3.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

SE section 3.3.2.3 discusses AMR results for components that the applicant stated are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the SLRA.

3.3.2.1 Aging Management Review Results Consistent with the GALL-SLR Report

The following subsections document the staff's review of those AMR results listed in SLRA tables 3.3.2-1 through 3.3.2-13 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat the review of the matters described in the GALL-SLR Report; however, the staff did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-SLR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions as documented in the GALL-SLR Report are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SE table 3.3-1, and no separate writeup is required or provided. For AMR items that required additional evaluation (such as responses to RAIs), the staff documents the evaluation in sections 3.3.2.1.2 through 3.3.2.1.5.

The applicant changed the designation for item 3.3-1, 233, from "This item is not used in the SRP-SLR" in the original submittal to "Not applicable" as part of SLRA Supplement 1. The staff finds this change acceptable.

SE section 3.3.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable or not used.

3.3.2.1.1 Aging Management Review Results Identified as Not Applicable or Not Used

For SLRA table 3.3-1, items 3.3-1, 003a; 3.3-1, 007; 3.3-1, 010; 3.3-1, 018; 3.3-1, 025; 3.3-1, 030; 3.3-1, 043; 3.3-1, 044; 3.3-1, 048; 3.3-1, 051; 3.3-1, 055; 3.3-1, 060; 3.3-1, 065; 3.3-1, 073; 3.3-1, 089; 3.3-1, 090; 3.3-1, 093; 3.3-1, 094; 3.3-1, 094a; 3.3-1, 096b; 3.3-1, 101; 3.3-1, 103; 3.3-1, 104; 3.3-1, 111; 3.3-1, 113; 3.3-1, 115; 3.3-1, 122; 3.3-1, 123; 3.3-1, 133; 3.3-1, 136; 3.3-1, 140; 3.3-1, 147; 3.3-1, 149; 3.3-1, 155; 3.3-1, 157; 3.3-1, 158; 3.3-1, 161; 3.3-1, 166; 3.3-1, 167; 3.3-1, 169; 3.3-1, 170; 3.3-1, 172; 3.3-1, 177, through 3.3-1, 179; 3.3-1, 18; 13.3-1, 182; 3.3-1, 185; 3.3-1, 186; 3.3-1, 194, through 3.3-1, 198; 3.3-1, 207; 3.3-1, 208; 3.3-1, 210; 3.3-1, 214, through 3.3-1, 216; 3.3-1, 218; 3.3-1, 219; 3.3-1, 222; 3.3-1, 223; 3.3-1, 226, through 3.3-1, 231; 3.3-1, 233; 3.3-1, 236, through 3.3-1, 241; 3.3-1, 245; 3.3-1, 247; 3.3-1, 248; 3.3-1, 250; 3.3-1, 252, through 3.3-1, 254; 3.3-1, 258; 3.3-1, 259; 3.3-1, 261; 3.3-1, 262; 3.3-1, 265; and 3.3-1, 266, the applicant claimed that the corresponding AMR items in the GALL-SLR Report are not applicable to PSL. The staff reviewed the SLRA, the description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents, and confirmed that the applicant's SLRA does not have any AMR results that are applicable to these items.

For SLRA table 3.3-1, items 3.3-1, 016; 3.3-1, 019; 3.3-1, 021; 3.3-1, 022; 3.3-1, 026; 3.3-1, 027; 3.3-1, 047; 3.3-1, 110; and 3.3-1, 203, the applicant claimed that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items apply only to BWRs. The staff reviewed the SRP-SLR, confirmed that these items apply only to BWRs, and finds that these items are not applicable to PSL, because it is a PWR.

SLRA table 3.3-1, AMR item 3.3-1, 250, addresses loss of material due to general, pitting, or crevice corrosion and to microbiologically induced corrosion for steel tanks, piping, and piping components in reactor coolant pump oil collection systems that are exposed to lubricating oil (waste oil). The applicant stated that this item is not used. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.3.2.1.1 and finds it acceptable, because the component in question is assigned in line item 3.3-1, 097, which indicates that the lubricating oil analysis program and the one-time inspection program will be used to manage loss of material due to general, pitting, or crevice corrosion and to microbiologically induced corrosion.

3.3.2.1.2 Loss of Material Due to General, Pitting, or Crevice Corrosion and to Microbiologically Induced Corrosion; Flow Blockage Due to Fouling

SLRA table 3.3-1, AMR item 3.3-1, 111, as modified by SLRA Supplement 1, addresses loss of material due to general, pitting, or crevice corrosion for structural steel exposed to uncontrolled indoor air. The applicant stated that this item is not used. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.3.2.1.2 and finds it acceptable, because the aging effect of loss of material due to general, pitting, or crevice corrosion for structural steel exposed to uncontrolled indoor air is managed by the Structures Monitoring program and addressed under AMR item 3.5-1, 077.

3.3.2.1.3 Wall Thinning Due to Erosion

SLRA table 3.3-1, item 3.3-1, 126, addresses wall thinning due to erosion for piping, valves, and a number of other component types in steel, copper, and several other materials exposed to raw water and wastewater environments. The SLRA cites generic note E and credits either the fire water system program, the inspection of internal surfaces in miscellaneous piping and ducting components program, or the open-cycle cooling water system program, instead of the GALL-recommended flow-accelerated corrosion program, to manage wall thinning due to erosion.

Based on the review of components associated with item 3.3-1, 126, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the three above-named programs acceptable, because the periodic visual inspections of internal surfaces that are performed under each program are capable of detecting wall thinning due to erosion, which is consistent with the guidance in the flow-accelerated corrosion program to use plant-specific operating experience to identify susceptible locations.

3.3.2.1.4 Cracking Due to Stress Corrosion Cracking of Copper Alloy

SLRA table 3.3-1, item 3.3-1, 160, addresses cracking due to SCC for piping and piping components made of copper alloy containing over 15 percent zinc that are exposed to raw water. For the SLRA table 2 AMR item that cites generic note E, the SLRA credits the fire water system program and the inspection of internal surfaces in miscellaneous piping and ducting components program to manage cracking for nozzles, strainers, and valve bodies made of copper alloy containing over 15 percent zinc that are exposed internally to raw water. The GALL-SLR Report recommends the use of programs similar to the inspection of internal surfaces in miscellaneous piping and ducting components program to manage this combination of material, environment and aging effect. The staff notes that the AMR item submitted with a note E and crediting the inspection of internal surfaces in miscellaneous piping and ducting components program could have been submitted as a note A. As discussed in section 3.0.3.2.16 of this SE, after implementation of Enhancement 1, the fire water system program will include inspection methods and acceptance criteria similar to those of the programs recommended by the GALL-SLR Report and will therefore be capable of identifying cracking due to SCC in nozzles, strainers, and valve bodies made of copper alloy containing over 15 percent zinc, before any loss of intended function.

Based on the review of components associated with item 3.3-1, 160 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the relevant combination of material, environment and aging effect using the fire water system program and the inspection of internal surfaces in miscellaneous piping and ducting components program acceptable because: these programs rely on internal inspections performed during periodic system and component surveillance, or during maintenance activities when the surfaces are made accessible for visual inspection. The programs include visual inspections and, when appropriate, surface examinations.

3.3.2.1.5 Cracking Due to Stress Corrosion Cracking

SLRA table 3.4-1, item 3.4-1, 106 addresses cracking due to stress corrosion cracking for copper alloy, with greater than 15 percent zinc, emergency diesel generator (EDG) engine heat exchangers (radiator tubes) exposed to air and condensation environments. For the SLRA table 2 item that cites generic note E, SLRA table 3.3.2-4 (as modified in response to RAI B.2.3.23-2 (letter dated April 21, 2023, ML23111A129)) credits the one-time inspection program to manage this aging effect for the Unit 2 EDG radiator tubes instead of the GALL-SLR recommended program. The item cites plant-specific note 3, stating that volumetric examinations will be utilized to inspect the radiator tubes for cracking. The staff notes that in response to RAI B.2.3.23-2, the applicant determined that visual examinations for loss of material and cracking of the Unit 2 radiator tubes using the external surfaces monitoring of mechanical components program did not appear to be feasible. The staff also notes that the Unit 1 radiators are periodically replaced, resulting in these Unit 1 components to not require an AMR.

Based on the review of components associated with item 3.4-1, 106, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the one-time inspection program acceptable because the proposed volumetric examinations can effectively identify cracking due to stress corrosion cracking in the EDG radiator tubes. The staff also considered that the applicant will continue to manage other aging effects (i.e., reduction of heat transfer due to fouling) for the EDG radiator tubes using the external surfaces monitoring of mechanical components program.

3.3.2.2 Aging Management Review Results for Which the GALL-SLR Report Recommends Further Evaluation

In SLRA section 3.3.2.2, the applicant further evaluated aging management for the auxiliary system components, as recommended by the GALL-SLR Report, and explained how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria in SRP-SLR section 3.3.2.2. The following subsections document the staff's review.

3.3.2.2.1 Cumulative Fatigue Damage

SLRA section 3.3.2.2.1 is associated with SLRA table 3.3-1, item 002, which states that the TLAA on cumulative fatigue damage in the components of auxiliary systems is evaluated in accordance with 10 CFR 54.21(c)(1) and addressed in SLRA section 4.3.2 The staff finds that the applicant's evaluation of the TLAA is consistent with SRP-SLR section 3.3.2.2.1 and is, therefore, acceptable. SE section 4.3.2 documents the staff's evaluation of the TLAA for the components of auxiliary systems.

3.3.2.2.2 Cracking Due to Stress Corrosion Cracking and Cyclic Loading

SLRA section 3.3.2.2.2 is associated with SLRA table 3.3-1, items 3.3-1, 003, and 3.3-1, 003a, which address stainless steel heat exchanger tubing exposed to treated borated water at temperatures greater than 60 degrees Celsius (140 degrees Fahrenheit) in the chemical and volume control system (CVCS), for which SCC and cyclic loading will be managed by GALL-SLR AMP XI.M2, "Water Chemistry," and AMP XI.M21A, "Closed Treated Water Systems." The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.3.2.2.2.

The staff noted that a search of the applicant's corrective actions database did not yield any evidence of SCC in the stainless steel nonregenerative heat exchanger in the CVCS. In the review of components associated with item 3.3-1, 003, the staff finds that the applicant has met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the water chemistry program is acceptable, because no evidence was found to indicate SCC or cyclic loading of the stainless steel heat exchanger tubing in the CVCS. This satisfies the criteria of the further evaluation item 3.3.2.2.2 in the SRP-SLR.

The staff also noted that SLRA section 3.3.2.2.2, which is associated with SLRA table 3.3-1, AMR item 3.3-1, 003a, addresses cracking due to SCC and cyclic loading for stainless steel heat exchanger tubing exposed to treated borated water at temperatures greater than 60 degrees Celsius (140 degrees Fahrenheit) in the CVCS. The applicant stated in the SLRA that this item is not used and is being addressed in item 3.3-1, 003. In the review of components associated with item 3.3-1, 003, the staff finds that the applicant's proposal to manage the effects of aging using the water chemistry program and the one-time inspection program is acceptable, because no evidence was found to indicate SCC or cyclic loading in the stainless steel nonregenerative heat exchanger tubing in the CVCS.

Based on the programs identified, the staff concludes that the applicant's program meets the SRP-SLR section 3.3.2.2.2 criteria. For those AMR items associated with SLRA section 3.3.2.2.2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

SLRA section 3.3.2.2.3 is associated with SLRA table 3.3-1, AMR items 3.3-1, 004, 3.3-1, 146, and 3.3-1, 205, which address cracking due to SCC for insulated and uninsulated stainless steel piping, piping components, and tanks exposed to air or condensation, and for underground stainless steel piping, piping components, and tanks, which will be managed by the external surfaces monitoring of mechanical components, inspection of internal surfaces in miscellaneous piping and ducting components, and buried and underground piping and tanks programs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.3.2.2.3.

In the review of components associated with AMR items 3.3-1, 004, 3.3-1, 146, and 3.3-1, 205, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging for AMR items 3.3-1, 004, 3.3-1, 146, and 3.3-1, 205 using the external surfaces monitoring of mechanical components, inspection of internal surfaces in miscellaneous piping and ducting components, and buried and underground piping and tanks programs is acceptable because the periodic inspections conducted as part of these programs are capable of detecting whether cracking is occurring.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.3.2.2.3 criteria. For those AMR items associated with SLRA section 3.3.2.2.3, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.3.2.2.3 is also associated with SLRA table 3.3-1, AMR items 3.3-1, 094a and 3.3-1, 231, which address cracking due to SCC for, respectively, stainless steel ducting and ducting components exposed to air or condensation, and stainless steel tanks within the scope of GALL-SLR AMP XI.M29 that are exposed to air or condensation. The applicant stated that these items are not applicable. Having evaluated the applicant's claim again the criteria in SRP-SLR section 3.3.2.2.3, the staff finds it acceptable, because a review of the UFSAR and SLRA confirms that the auxiliary systems contain no in-scope stainless steel ducting or ducting components exposed to air or condensation, and no stainless steel tanks within the scope of AMP XI.M29.

3.3.2.2.4 Loss of Material Due to Pitting and Crevice Corrosion in Stainless Steel and Nickel Alloys

SLRA section 3.3.2.2.4 is associated with SLRA table 3.3-1, AMR items 3.3-1, 006, 3.3-1, 232, and 3.3-1, 246, which address loss of material due to pitting and crevice corrosion for stainless steel and nickel alloy piping, piping components, tanks, and heat exchanger components exposed to air or condensation, and for underground stainless steel or nickel alloy piping, piping components, or tanks, which will be managed by the external surfaces monitoring of mechanical components, inspection of internal surfaces in miscellaneous piping and ducting components, and buried and underground piping and tanks programs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.3.2.2.4.

In the review of components associated with AMR items 3.3-1, 006, 3.3-1, 232, and 3.3-1, 246, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the external surfaces monitoring of mechanical components, inspection of internal surfaces in miscellaneous piping and ducting components, and buried and underground piping and tanks programs is acceptable because the periodic inspections conducted as part of these programs are capable of detecting whether loss of material is occurring.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.3.2.2.4 criteria. For those AMR items associated with SLRA section 3.3.2.2.4, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.3.2.2.4 is also associated with SLRA table 3.3-1, AMR items 3.3-1, 222 and 3.3-1, 241, which address loss of material due to pitting or crevice corrosion for stainless steel or nickel alloy tanks exposed internally or externally to air or condensation, and for stainless steel or nickel alloy heat exchanger components exposed to air or condensation. The applicant stated that these items are not used because stainless steel tanks and heat exchanger components exposed to air or condensation are managed using different AMR items. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.3.2.2.4 and finds it acceptable. This is based on the applicant's proposal to manage stainless steel tanks exposed to air or condensation in the auxiliary systems using AMR items 3.3-1, 006 and 3.3-1, 232 with the inspection of internal surfaces in miscellaneous piping and ducting components program and the external surfaces monitoring of mechanical components program, which include periodic inspections capable of detecting whether loss of material is occurring. In addition, based on a review of the UFSAR and SLRA, there are no in-scope nickel alloy tanks or heat exchanger components in the auxiliary systems.

SLRA section 3.3.2.2.4 is also associated with SLRA table 3.3-1, AMR items 3.3-1, 094 and 3.3-1, 228, which address loss of material due to pitting and crevice corrosion for stainless steel ducting and ducting components exposed to air or condensation, and for stainless steel or nickel alloy tanks within the scope of GALL-SLR AMP XI.M29 that are exposed to air or condensation. The applicant stated that these items are not applicable. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.3.2.2.4, the staff finds it acceptable, because a review of the UFSAR and SLRA confirms that the auxiliary systems contain no in-scope stainless steel ducting or ducting components exposed to air or condensation, and no underground stainless steel or nickel alloy tanks within the scope of AMP XI.M29.

3.3.2.2.5 Quality Assurance for Aging Management of Nonsafety-Related Components

SE section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.3.2.2.6 Ongoing Review of Operating Experience

SE section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of operating experience.

3.3.2.2.7 Loss of Material Due to Recurring Internal Corrosion

SLRA section 3.3.2.2.7 is associated with SLRA table 3.3-1, item 3.3-1, 127 and addresses loss of material due to recurring internal corrosion in metallic piping components exposed several water environments. The SLRA states that plant-specific operating experience showed that carbon steel components exposed to raw water in the intake cooling water system have experienced recurring internal corrosion. The SLRA notes that the open-cycle cooling water system program, which manages the effects of aging for the intake cooling water system, is enhanced to manage loss of material due to recurring internal corrosion.

The staff's review of the enhancements to PSL's open-cycle cooling water system program is documented in SE section 3.0.3.2.11. The staff determined that the program enhancement to adjust the monitoring frequency of locations susceptible to ongoing degradation, based on trending of wall thickness measurements, meets the further evaluation criteria for managing recurring internal corrosion in SRP-SLR section 3.3.2.2.7. Therefore, the staff finds that PSL's proposed approach to manage recurring internal corrosion, using the enhanced open-cycle cooling water system program, is acceptable.

3.3.2.2.8 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA section 3.3.2.2.8 is associated with SLRA table 3.3-1, AMR item 3.3-1, 189, which addresses cracking due to SCC for aluminum piping, piping components, and tanks exposed to air, condensation, raw water, raw water (potable), or wastewater, which will be managed by the inspection of internal surfaces in miscellaneous piping and ducting components program and the external surfaces monitoring of mechanical components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.3.2.2.8.

In the review of components associated with AMR item 3.3-1, 189, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the inspection of internal surfaces in miscellaneous piping and ducting components program and the external surfaces monitoring of mechanical components program is acceptable, because the periodic inspections conducted as part of these programs are capable of detecting whether cracking is occurring.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.3.2.2.8 criteria. For those AMR items associated with SLRA section 3.3.2.2.8, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.3.2.2.8 is also associated with SLRA table 3.3-1, AMR item 3.3-1, 254, which addresses cracking due to SCC for aluminum heat exchanger components exposed to air or condensation. The applicant stated this item is not used, because these components are addressed using different AMR items. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.3.2.2.8 and finds it acceptable. This is based on the applicant's proposal to manage aluminum heat exchanger components exposed to air or condensation using AMR item 3.3-1, 189 with the inspection of internal surfaces in miscellaneous piping and ducting components program and the external surfaces monitoring of mechanical components program, which include periodic inspections that are capable of detecting whether cracking is occurring.

SLRA section 3.3.2.2.8 is also associated with SLRA table 3.3-1, AMR items 3.3-1, 186, 3.3-1, 192, and 3.3-1, 233, which address cracking due to SCC for aluminum tanks within the scope of GALL-SLR AMP XI.M29 that are exposed to air, condensation, soil, concrete, raw water, or wastewater; underground piping, piping components, and tanks; and insulated aluminum piping, piping components, and tanks exposed to air or condensation. The applicant stated that these items are not applicable. Item 3.3-1, 233 was originally omitted from table 3.3.1 in the SLRA but was added as a not-applicable item in Attachment 4 to SLRA Supplement 1. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.3.2.2.8, the staff finds it acceptable because a review of the UFSAR and SLRA, as amended by Supplement 1, confirms that the auxiliary systems contain no aluminum tanks within the scope of GALL-SLR AMP XI.M29, and no underground or insulated aluminum piping, piping components, or tanks.

3.3.2.2.9 Loss of Material Due to General, Crevice, or Pitting Corrosion and Cracking Due to Stress Corrosion Cracking

SLRA section 3.3.2.2.9 (as amended by letter dated August 9, 2022 (ML22221A134), in response to RAI 3.3.2.2.9-1) is associated with SLRA table 3.3-1, AMR items 3.3-1, 112 and

3.3-1, 202, which address (1) loss of material due to general, crevice, or pitting corrosion in steel piping and piping components exposed to concrete (item 3.3-1, 112), and (2) loss of material due to crevice or pitting corrosion and cracking due to SCC in stainless steel piping and piping components exposed to concrete (item 3.3-1, 202). The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.3.2.2.9.

In the review of outdoor steel piping and piping components exposed to concrete in the auxiliary systems, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the buried and underground piping and tanks program is acceptable, because the periodic visual or volumetric inspections performed as part of this program are capable of detecting loss of material in steel piping. In addition, for indoor steel piping and ducting exposed to concrete in the ventilation system, the staff finds that the applicant has met the further evaluation criteria. The staff also reviewed the applicant's claim against the criteria in SRP-SLR section 3.3.2.2.9 and finds it acceptable for the following reasons: (1) the components are encased in concrete that conforms to ACI 318, (2) plant-specific operating experience did not reveal any instances of degradation of concrete around embedded components that could lead to penetration of water, and (3) the components are not potentially exposed to ground water.

For the indoor Unit 2 diesel oil storage tanks and condensate storage tank, the staff's review is as follows. The staff notes that GALL-SLR Report, AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," was revised to state that the scope of the program includes indoor metallic tanks that sit on concrete where plant-specific operating experience reveals that the tank-bottom-to-concrete interface is periodically exposed to ground water. The staff's basis for including this recommendation in the GALL-SLR Report (as documented in NUREG-2221, "Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG–2191 and NUREG–2192," issued December 2017) was operating experience involving the facility of a recent license renewal applicant, where a tank located in a building below grade elevation experienced ground water intrusion from a leak in a nearby wall penetration (ML14069A169). The staff reviewed the applicant's claim against the criteria in SRP-SLR section 3.3.2.2.9 and finds it acceptable, because (1) unlike the tank in the operating experience noted above, the subject tanks are elevated above floor level in above-grade structures and, are therefore, not potentially exposed to ground water, and (2) plant-specific operating experience did not reveal any instances of degradation of indoor concrete that could lead to penetration of water to the interface locations.

Furthermore, the staff noted that SLRA table 3.3-1, AMR item 3.3-1, 202, states that "[t]here are no aging effects that require management for stainless steel piping or piping components exposed to concrete in the waste disposal system and in the reactor cavity sump because they are not exposed to concrete that is regularly exposed to water." In the review of components associated with item 3.3-1, 202, the staff finds that the applicant has met the further evaluation criteria. The staff also reviewed the applicant's claim against the criteria in SRP-SLR section 3.3.2.2.9 and finds it acceptable because the components are not potentially exposed to ground water.

Based on the program identified, the staff concludes that the applicant's program meets the SRP-SLR section 3.3.2.2.9 criteria. For those AMR items associated with SLRA section 3.3.2.2.9, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.10 Loss of Material Due to Pitting and Crevice Corrosion in Aluminum Alloys

SLRA section 3.3.2.2.10 is associated with SLRA table 3.3-1, AMR items 3.3-1, 234 and 3.3-1, 242, which address loss of material due to pitting and crevice corrosion for aluminum piping, piping components, tanks, and heat exchanger components exposed to air or condensation, which will be managed by the inspection of internal surfaces in miscellaneous piping and ducting components program and the external surfaces monitoring of mechanical components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.3.2.2.10.

In the review of components associated with AMR items 3.3-1, 234 and 3.3-1, 242, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the inspection of internal surfaces in miscellaneous piping and ducting components program and the external surfaces monitoring of mechanical components program is acceptable because the periodic inspections conducted as part of these programs are capable of detecting whether loss of material is occurring.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.3.2.2.10 criteria. For those AMR items associated with SLRA section 3.3.2.2.10, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.3.2.2.10 is also associated with SLRA table 3.3-1, AMR items 3.3-1, 223, 3.3-1, 227, 3.3-1, 240, 3.3-1, 245, and 3.3-1, 247, which address loss of material due to pitting or crevice corrosion for aluminum underground piping, piping components, and tanks; tanks within the scope of GALL-SLR AMP XI.M29; insulated aluminum piping, piping components, and tanks exposed to air or condensation; and aluminum piping, piping components, tanks, and heat exchanger components exposed to wastewater. The applicant stated that these items are not applicable. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.3.2.2.10, the staff finds it acceptable, because a review of the UFSAR and SLRA confirms that there are no in-scope aluminum alloy components with the above component and environment combinations in the auxiliary systems.

3.3.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

The following subsections document the staff's review of those AMR results listed in SLRA tables 3.3.2-1 through 3.3.2-13 that are either not consistent with or not addressed in the GALL-SLR Report and that are usually denoted with generic notes F through J. To efficiently capture and identify multiple applicable AMR items in each subsection, and because these AMR items often are not associated with a table 1 item, the subsections are organized by applicable AMR sections and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-SLR Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended functions consistent with the CLB for the subsequent period of extended operation. The following sections document the staff's evaluation.

3.3.2.3.1 Diesel Generators and Support Systems

Copper Alloy and Copper Alloy with Greater than 15 Percent Zinc Piping and Valve Bodies Internally and Externally Exposed to Air-Indoor Uncontrolled. As modified in response to RAI B.2.3.23-1 (letter dated April 21, 2023, ML23111A129), SLRA table 3.3.2-4 states that loss of material for copper alloy piping and valve bodies externally exposed to uncontrolled indoor air will be managed by the external surfaces monitoring of mechanical components program. SLRA table 3.3.2-4 also states that loss of material and cracking for copper alloy with greater than 15 percent zinc valve bodies internally exposed to uncontrolled indoor air will be managed by the inspection of internal surfaces in miscellaneous piping and ducting components program. The applicant identified loss of material and cracking as additional aging effects requiring management and cited generic note H for these materials in the stated environment. The AMR items cite plant-specific note 2 for these items stating:

> Based on plant-specific operating experience, all metallic structures and components located in the PSL Unit 1 and 2 EDG rooms, including copper alloy and copper alloy with greater than 15 percent zinc components exposed to an air-indoor uncontrolled environment, may have aging effects requiring management during the SPEO [subsequent period of extended operation].

The staff notes that the applicant clarified the description of the uncontrolled indoor air in SLRA table 3.0-1 by stating that this environment may include humid, salt-laden air in locations that have high velocity air flow rates in buildings that draw in outdoor air. The staff also notes the applicant's response to RAI B.2.3.23-1 established that the introduction of salt-laden air only occurs in the Units 1 and 2 EDG rooms because of the significantly increased ventilation flow rates during EDG engine radiator fan operation. The staff finds the applicant's proposal to manage the effects of aging acceptable because visual inspections or surface examinations of the cited components, being performed by the associated programs, can effectively identify loss of material and cracking prior to a component's loss of intended function.

Copper Alloy with Greater than 15 Percent Zinc Heat Exchangers Externally Exposed to Air-Indoor Uncontrolled. As modified in response to RAI B.2.3.23-2 (letter dated April 21, 2023, ML23111A129), SLRA table 3.3.2-4 states that loss of material for Unit 2's copper alloy with greater than 15 percent zinc EDG radiator tubes exposed to uncontrolled indoor air will be managed by the one-time inspection program. The applicant identified loss of material as an additional aging effect requiring management and cited generic note H for these components. The item cites plant-specific note 3, stating that volumetric examinations will be utilized to inspect the radiator tubes for loss of material. The staff notes that in response to RAI B.2.3.23-2, the applicant determined that visual examinations for loss of material and cracking of the Unit 2 EDG radiator tubes using the external surfaces monitoring of mechanical components program did not appear to be feasible. The staff also notes that the Unit 1 radiators are periodically replaced, resulting in these Unit 1 components to not require an AMR.

The staff finds the applicant's proposal to manage the effects of aging using the one-time inspection program acceptable because volumetric examinations can effectively identify loss of material in the EDG radiator tubes. The staff also considered that the applicant will continue to manage other aging effects (i.e., reduction of heat transfer due to fouling) for the EDG radiator tubes using the external surfaces monitoring of mechanical components program.

Copper Alloy with Greater than 15 Percent Zinc Heat Exchanger Radiator Tubes (Unit 2), Filters (Unit 2), Hose Reels, Nozzles, Piping, Strainers, and Valve Bodies Exposed to Air-Indoor

Uncontrolled and Air-Outdoor. As amended by letter dated April 21, 2023 (ML23111A129), SLRA tables 3.3.2-4, 3.3.2-5, 3.3.2-7, 3.3.2-8, and 3.4.2-1 state that loss of material due to selective leaching for copper alloy with greater than 15 percent zinc heat exchanger radiator tubes (Unit 2), filters (Unit 2), hose reels, nozzles, piping, strainers, and valve bodies exposed to uncontrolled indoor air and outdoor air will be managed by the selective leaching program. The AMR items cite generic note H, for which the applicant has identified loss of material due to selective leaching as an additional aging effect. The associated AMR items cite various plant-specific notes stating that based on new plant-specific OE (dezincification of Unit 1 EDG radiator tubes), discussed in SLRA section B.2.3.21, one-time inspections will be performed on a representative sample of components, using the elements of the selective leaching AMP, to determine if selective leaching is present in the outdoor air and uncontrolled indoor air environments. The staff finds the applicant's proposal to perform one-time inspections, in lieu of periodic selective leaching inspections acceptable as follows for uncontrolled indoor air and outdoor air (respectively):

- The staff finds that the environment which resulted in the new plant-specific OE (i.e., damp conditions from periodic rinsing, elevated temperature during operation, accumulation of corrosive deposits) is more aggressive than the uncontrolled indoor air environment to which other copper alloy with greater than 15 percent zinc components are exposed (i.e., normally dry, limited accumulation of corrosive deposits, protected from weather). The applicant intends to perform a one-time inspection of a representative sample of the Unit 2 EDG admiralty brass radiator tubes exposed to uncontrolled indoor air to confirm that selective leaching is an aging effect unique to the Unit 1 EDG radiator tubes. The staff notes that, as discussed in SE section 2.3.2, the Unit 1 EDG radiators have been periodically replaced since 2001 and, therefore, are not long-lived components subject to an AMR. Based on the less aggressive environment, the staff finds that the applicant has provided a reasonable basis for why copper alloy with greater than 15 percent zinc components exposed to uncontrolled indoor air do not need to be managed for loss of material due to selective leaching.
- Although the applicant stated loss of material due to selective leaching in an air environment is an aging effect unique to the external surfaces of the Unit 1 EDG radiators, the staff noted that the environment which resulted in the new plant-specific OE has similarities to the GALL-SLR Report table IX.D, "Use of Terms for Environments," definition of air-outdoor (e.g., exposure to precipitation and salt-laden air). For instances where an aging effect is not expected to occur, but the data are insufficient to rule it out with reasonable confidence, the staff noted the GALL-SLR Report recommends the use of one-time inspections. The staff finds the applicant's approach to perform one-time inspections of copper alloy with greater than 15 percent zinc components exposed to outdoor air to be reasonable because although dezincification is not expected to occur for these components, the staff does not have a sufficient basis to rule it out with reasonable confidence (based on the similarities between the environment which resulted in the new plant-specific OE and the GALL-SLR Report definition of air-outdoor).

3.3.2.3.2 Fire Protection / Service Water

Copper Alloy with Greater than 15 Percent Zinc Hose Reels, Nozzles, Piping, Strainers, and Valve Bodies Exposed to Air-Outdoor. The staff's evaluation for copper alloy with greater than 15 percent zinc hose reels, nozzles, piping, strainers, and valve bodies exposed to outdoor air, which will be managed for loss of material due to selective leaching by the selective leaching program and are associated with generic note H, is documented in SE section 3.3.2.3.1.

3.3.2.3.3 Instrument Air / Miscellaneous Bulk Gas Supply

Copper Alloy with Greater than 15 Percent Zinc Valve Bodies Exposed to Air-Outdoor. The staff's evaluation for copper alloy with greater than 15 percent zinc valve bodies exposed to outdoor air, which will be managed for loss of material due to selective leaching by the selective leaching program and are associated with generic note H, is documented in SE section 3.3.2.3.1.

3.3.2.3.4 Intake Cooling Water / Emergency Cooling Canal

Copper Alloy with Greater than 15 Percent Zinc Piping Exposed to Air-Outdoor. The staff's evaluation for copper alloy with greater than 15 percent zinc piping exposed to outdoor air, which will be managed for loss of material due to selective leaching by the selective leaching program and is associated with generic note H, is documented in SE section 3.3.2.3.1.

3.3.2.3.5 Fire Protection / Service Water—Summary of Aging Management Evaluation—SLRA table 3.3.2-5

SLRA table 3.3.2-5, item 3.3-1, 135, states that loss of material and flow blockage for stainless steel pump casings exposed to raw water will be managed by the external surfaces monitoring of mechanical components program. The AMR item cites generic note G. The staff reviewed the associated items in the SLRA and considered whether the aging effects proposed by the applicant constitute all of the applicable aging effects for this component, material, and environment description. The staff noted that the applicant addressed loss of material and flow blockage for this component, material, and environment combination in other AMR items. Based on the review of the materials, environments, and aging effects requiring management that are listed for the pump casing in the SLRA, the staff finds that the applicant has identified all applicable aging effects for this component, material, and environment combination.

The staff finds the applicant's proposal to manage the aging effects using the external surfaces monitoring of mechanical components program acceptable because this program includes visual exams that are capable of detecting loss of material and flow blockage in stainless steel components before loss of intended function.

3.4 Aging Management of Steam and Power Conversion Systems

3.4.1 Summary of Technical Information in the Application

SLRA section 3.4 provides AMR results for those components that the applicant identified in SLRA section 2.3.4, "Steam and Power Conversion Systems," as being subject to an AMR. SLRA table 3.4-1, "Summary of Aging Management Evaluations for the Steam and Power Conversion Systems," gives a summary comparison of the applicant's AMRs with those evaluated in the GALL-SLR Report for the steam and power conversion system components.

3.4.2 Staff Evaluation

Table 3.4-1 summarizes the staff's evaluation of the component groups listed in SLRA section 3.4 and addressed in the GALL-SLR Report.

Table 3.4-1 Staff Evaluation for Steam and Power Conversion Systems Components in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4-1, 001	Consistent with the GALL-SLR Report (see SE section 3.4.2.2.1)
3.4-1, 002	Consistent with the GALL-SLR Report (see SE section 3.4.2.2.2)
3.4-1, 003	Consistent with the GALL-SLR Report (see SE section 3.4.2.2.3)
3.4-1, 004	Consistent with the GALL-SLR Report
3.4-1, 005	Consistent with the GALL-SLR Report
3.4-1, 006	Consistent with the GALL-SLR Report
3.4-1, 007	Not applicable to PSL
3.4-1, 008	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 009	Consistent with the GALL-SLR Report
3.4-1, 010	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 011	Consistent with the GALL-SLR Report
3.4-1, 012	Consistent with the GALL-SLR Report
3.4-1, 013	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 014	Consistent with the GALL-SLR Report
3.4-1, 015	Consistent with the GALL-SLR Report
3.4-1, 016	Consistent with the GALL-SLR Report
3.4-1, 017	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 018	Consistent with the GALL-SLR Report
3.4-1, 019	Not applicable to PSL
3.4-1, 020	Not applicable to PSL
3.4-1, 021	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 022	Not applicable to PSL
3.4-1, 023	Not applicable to PSL
3.4-1, 024	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 025	Not Used. Addressed by 3.4-1, 015
3.4-1, 026	Not applicable to PSL
3.4-1, 027	Not applicable to PSL
3.4-1, 028	Not applicable to PSL
3.4-1, 029	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 030	Consistent with the GALL-SLR Report
3.4-1, 031	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 032	Not applicable to PSL
3.4-1, 033	Consistent with the GALL-SLR Report
3.4-1, 034	Consistent with the GALL-SLR Report
3.4-1, 035	Consistent with the GALL-SLR Report (see SE section 3.4.2.2.9)
3.4-1, 036	Consistent with the GALL-SLR Report
3.4-1, 037	Not applicable to PSL
3.4-1, 038	Not applicable to PSL
3.4-1, 039	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 040	Consistent with the GALL-SLR Report
3.4-1, 041	Consistent with the GALL-SLR Report
3.4-1, 042	Not applicable to PSL

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4-1, 043	Not applicable to PSL
3.4-1, 044	Consistent with the GALL-SLR Report
3.4-1, 045	Not applicable to PSL
3.4-1, 046	Consistent with the GALL-SLR Report
3.4-1, 047	Consistent with the GALL-SLR Report
3.4-1, 048	Not applicable to PSL
3.4-1, 049	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 050	Consistent with the GALL-SLR Report
3.4-1, 050a	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 051	Consistent with the GALL-SLR Report (see SE section 3.4.2.2.8)
3.4-1, 052	Consistent with the GALL-SLR Report
3.4-1, 053	Not applicable to PSL
3.4-1, 054	Not applicable to PSL
3.4-1, 055	Consistent with the GALL-SLR Report
3.4-1, 056	Not used
3.4-1, 057	Not applicable to PSL
3.4-1, 058	Consistent with the GALL-SLR Report
3.4-1, 059	Consistent with the GALL-SLR Report
3.4-1, 060	Consistent with the GALL-SLR Report
3.4-1, 061	Not applicable to PSL (see SE section 3.4.2.2.6)
3.4-1, 062	Consistent with the GALL-SLR Report
3.4-1, 063	Consistent with the GALL-SLR Report
3.4-1, 064	Consistent with the GALL-SLR Report
3.4-1, 065	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 066	Consistent with the GALL-SLR Report
3.4-1, 067	Not applicable to PSL
3.4-1, 068	Not applicable to PSL
3.4-1, 069	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 070	Not applicable to PSL
3.4-1, 071	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 072	Consistent with the GALL-SLR Report
3.4-1, 073	Consistent with the GALL-SLR Report
3.4-1, 074	Not applicable to PSL (see SE section 3.4.2.2.2)
3.4-1, 075	Consistent with the GALL-SLR Report
3.4-1, 076	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 077	Not applicable to PSL
3.4-1, 078	Not applicable to PSL
3.4-1, 079	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 080	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 081	Not applicable to PSL
3.4-1, 082	Not used. Addressed by 3.4-1, 047, and 3.4-1, 072 (see SE section 3.4.2.2.8)
3.4-1, 083	Not applicable to PSL
3.4-1, 084	Consistent with the GALL-SLR Report
3.4-1, 085	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4-1, 086	Not applicable to PSL
3.4-1, 087	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 088	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 089	Consistent with the GALL-SLR Report
3.4-1, 090	Not applicable to PSL
3.4-1, 091	Not applicable to PSL
3.4-1, 092	Not applicable to PSL
3.4-1, 093	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 094	Not applicable to PSL (see SE section 3.4.2.2.9)
3.4-1, 095	Not applicable to PSL (see SE section 3.4.2.2.3)
3.4-1, 096	Not applicable to PSL
3.4-1, 097	Not applicable to PSL (see SE section 3.4.2.2.9)
3.4-1, 098	Not applicable to PSL (see SE section 3.4.2.2.3)
3.4-1, 099	Not applicable to PSL
3.4-1, 100	Not applicable to PSL (see SE section 3.4.2.2.2)
3.4-1, 101	Not applicable to PSL
3.4-1, 102	Not applicable to PSL (see SE section 3.4.2.2.7)
3.4-1, 103	Consistent with the GALL-SLR Report (see SE section 3.4.2.2.3)
3.4-1, 104	Consistent with the GALL-SLR Report (see SE section 3.4.2.2.2)
3.4-1, 105	Not applicable to PSL (see SE section 3.4.2.2.7)
3.4-1, 106	Consistent with the GALL-SLR Report
3.4-1, 107	Not applicable to PSL
3.4-1, 108	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 109	Consistent with the GALL-SLR Report (see SE section 3.4.2.2.7)
3.4-1, 110	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 111	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 112	Not applicable to PSL (see SE section 3.4.2.2.7)
3.4-1, 113	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 114	Not applicable to PSL
3.4-1, 115	Not applicable to PSL
3.4-1, 116	Not applicable to PSL
3.4-1, 117	Not applicable to PSL
3.4-1, 118	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 119	Not applicable to PSL (see SE section 3.4.2.2.9)
3.4-1, 120	Not applicable to PSL (see SE section 3.4.2.2.9)
3.4-1, 121	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 122	Not applicable to PSL
3.4-1, 123	Not applicable to PSL
3.4-1, 124	Not applicable to PSL
3.4-1, 125	Not applicable to PSL
3.4-1, 126	Not applicable to PSL
3.4-1, 127	Not applicable to PSL
3.4-1, 128	Not applicable to PSL
3.4-1, 129	Not applicable to PSL

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4-1, 130	Not applicable to PSL
3.4-1, 131	Not applicable to PSL
3.4-1, 132	Not used
3.4-1, 133	Not applicable to PSL
3.4-1, 134	Not applicable to PSL
3.4-1, 135	Not applicable to PSL

The following three sections summarize the staff's review of component groups, as described in SE section 3.0.2.2:

(1) SE section 3.4.2.1 discusses AMR results for components that the applicant stated either are not applicable to PSL or are consistent with the GALL-SLR Report. Section 3.4.2.1.1 summarizes the staff's review of items that are not applicable or not used and documents any RAIs issued and the staff's conclusions. The remaining subsections in SE section 3.4.2.1 document the review of components that required additional information or otherwise required explanation.

(2) SE section 3.4.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

(3) SE section 3.4.2.3 discusses AMR results for components that the applicant stated are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the SLRA.

3.4.2.1 Aging Management Review Results Consistent with the GALL-SLR Report

The following subsections document the staff's review of those AMR results listed in SLRA tables 3.4.2-1 through 3.4.2-3 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat the review of the matters described in the GALL-SLR Report; however, the staff did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-SLR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions as documented in the GALL-SLR Report are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SE table 3.4-1, and no separate writeup is required or provided.

SE section 3.4.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable or not used.

3.4.2.1.1 Aging Management Review Results Identified as Not Applicable or Not Used

For SLRA table 3.4-1, items 3.4-1, 019; 3.4-1, 020; 3.4-1, 022; 3.4-1, 023; 3.4-1, 025, through 3.4-1, 028; 3.4-1, 032; 3.4-1, 037; 3.4-1, 038; 3.4-1, 042; 3.4-1, 043; 3.4-1, 045; 3.4-1, 048; 3.4-1, 053; 3.4-1, 054; 3.4-1, 056; 3.4-1, 075; 3.4-1, 061; 3.4-1, 067; 3.4-1, 068; 3.4-1, 070; 3.4-1, 057; 3.4-1, 061; 3.4-1, 062; 3.4-1, 064; 3.4-1, 067; 3.4-1, 068; 3.4-1, 070; 3.4-1, 072; 3.4-1, 074; 3.4-1, 077; 3.4-1, 078; 3.4-1, 081; 3.4-1, 082; 3.4-1, 083; 3.4-1, 086; 3.4-1, 090, through 3.4-1, 092; 3.4-1, 094, through 3.4-1, 102; 3.4-1, 107; 3.4-1, 114, through 3.4-1, 117; 3.4-1, 119; 3.4-1, 120; and 3.4-1, 122, through 3.4-1, 135, the applicant claimed that the corresponding AMR items in the GALL-SLR Report are not used or not applicable to PSL. The staff reviewed the SLRA and UFSAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

For the following SLRA table 3.1-1 items, the applicant claimed that the corresponding items in the GALL-SLR Report are not used because they are addressed by other SLRA table 1 items: item 3.4-1, 025 (addressed by item 3.4-1, 015), and item 3.4-1, 082 (addressed by items 3.4-1, 047, and 3.4-1, 072). The staff reviewed the SLRA and confirmed that the aging effects are addressed by other SLRA table 1 items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

3.4.2.2 Aging Management Review Results for Which the GALL-SLR Report Recommends Further Evaluation

In SLRA section 3.4.2.2, the applicant further evaluated aging management for the steam and power conversion system components, as recommended by the GALL-SLR Report, and explained how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria in SRP-SLR section 3.4.2.2. The following subsections document the staff's review.

3.4.2.2.1 Cumulative Fatigue Damage

SLRA section 3.4.2.2.1, associated with SLRA table 3.4-1, item 001, states that the TLAA on cumulative fatigue damage in the components of the steam and power conversion systems is evaluated in accordance with 10 CFR 54.21(c)(1) and addressed in SLRA section 4.3.2. The staff find that this is consistent with SRP-SLR section 3.4.2.2.1 and is therefore acceptable. SE section 4.3.2 documents the staff's evaluation of the TLAA for the components of the steam and power conversion systems.

3.4.2.2.2 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

SLRA section 3.4.2.2.2 is associated with SLRA table 3.4-1, AMR items 3.4-1, 002 and 3.4-1, 104, which address cracking due to SCC for stainless steel piping, piping components, and tanks, either insulated or not insulated, that are exposed to air or condensation, as well as for underground stainless steel piping, piping components, and tanks, which will be managed by the external surfaces monitoring of mechanical components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.4.2.2.2.

In the review of components associated with AMR items 3.4-1, 002 and 3.4-1, 104, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging for AMR items 3.4-1, 002 and 3.4-1, 104 using the external surfaces monitoring of mechanical components program is acceptable because the periodic inspections conducted as part of this program are capable of detecting whether cracking is occurring.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.4.2.2.2 criteria. For those AMR items associated with SLRA section 3.4.2.2.2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.4.2.2.2 is also associated with SLRA table 3.4-1, AMR items 3.4-1, 074 and 3.4-1, 100, which address cracking due to SCC for underground stainless steel piping, piping components, and tanks, and for stainless steel tanks within the scope of GALL-SLR AMP XI.M29 exposed to air or condensation. The applicant stated that these items are not applicable. For item 3.4-1, 074, the applicant clarified in Attachment 1 of SLRA Supplement 1 that there are no underground stainless steel piping or piping components in the steam and power conversion systems. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.4.2.2.2, the staff finds it acceptable, because a review of the UFSAR and SLRA, as amended by Supplement 1, confirms that the steam and power conversion systems contain no underground stainless steel piping, piping components, or tanks, and no stainless steel tanks within the scope of GALL-SLR AMP XI.M29.

3.4.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion in Stainless Steel and Nickel Alloys

SLRA section 3.4.2.2.3 is associated with SLRA table 3.4-1, AMR items 3.4-1, 003 and 3.4-1, 103, which address loss of material due to pitting and crevice corrosion for, respectively, uninsulated and insulated stainless steel and nickel alloy piping, piping components, and tanks exposed to air or condensation, which will be managed by the external surfaces monitoring of mechanical components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.4.2.2.3.

In the review of components associated with AMR items 3.4-1, 003 and 3.4-1, 103, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging for AMR items 3.4-1, 003 and 3.4-1, 103 using the external surfaces monitoring of mechanical components program is acceptable because the periodic inspections conducted as part of this program are capable of detecting whether loss of material is occurring.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.4.2.2.3 criteria. For those AMR items associated with SLRA section 3.4.2.2.3, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.4.2.2.3 is also associated with SLRA table 3.4-1, AMR items 3.4-1, 095 and 3.4-1, 098, which address loss of material due to pitting or crevice corrosion for underground stainless steel or nickel alloy piping, piping components, and tanks, and for stainless steel or nickel alloy tanks within the scope of GALL-SLR AMP XI.M29 that are exposed to air or condensation. The applicant stated that these items are not applicable. For item 3.4-1, 095, the applicant clarified in Attachment 1 of SLRA Supplement 1 (ML22097A202) that there are no underground stainless steel piping or piping components in the steam and power conversion systems. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.4.2.2.2, the staff finds it acceptable, because a review of the UFSAR and SLRA, as amended by Supplement 1, confirms that the steam and power conversion systems contain no underground stainless steel piping, piping components, or tanks, and no stainless steel or nickel alloy tanks within the scope of GALL-SLR AMP XI.M29.

3.4.2.2.4 Quality Assurance for Aging Management of Non-Safety-Related Components

SE section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.4.2.2.5 Ongoing Review of Operating Experience

SE section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of operating experience.

3.4.2.2.6 Loss of Material Due to Recurring Internal Corrosion

SLRA section 3.4.2.2.6 is associated with SLRA table 3.4-1, item 3.4-1, 061 and addresses loss of material due to recurring internal corrosion in metallic components exposed to several water environments. The SLRA states that operating experience over the past 10 years did not show instances that met the criteria of recurring internal corrosion in the steam and power conversion systems. Consequently, recurring internal corrosion is not an applicable aging effect at the site. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.4.2.2.6 and finds it is acceptable because the staff also did not identify any instances of recurring internal corrosion in the steam and power conversion systems during the review of the operating experience documentation provided as part of the audit.

3.4.2.2.7 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA section 3.4.2.2.7 is associated with SLRA table 3.4-1, AMR item 3.4-1, 109, which addresses cracking due to SCC for aluminum piping, piping components, and tanks exposed to air, condensation, raw water, and wastewater, which will be managed by the external surfaces monitoring of mechanical components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.4.2.2.7.

In the review of components associated with AMR item 3.4-1, 109, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging for AMR item 3.4-1, 109 using the external surfaces monitoring of mechanical components program is acceptable because the periodic inspections conducted as part of this program are capable of detecting whether cracking is occurring.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.4.2.2.7 criteria. For those AMR items associated with SLRA section 3.4.2.2.7, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.4.2.2.7 is also associated with SLRA table 3.4-1, AMR items 3.4-1, 102, 3.4-1, 105, and 3.4-1, 112, which address cracking due to SCC for aluminum tanks within the scope of GALL-SLR AMP X.M29 that are exposed to air, condensation, soil, concrete, raw water, or wastewater; insulated aluminum piping, piping components, and tanks exposed to air or condensation; and underground aluminum piping, piping components, and tanks. The applicant stated that these items are not applicable. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.4.2.2.7, the staff finds it acceptable, because a review of the UFSAR and SLRA confirms that there are no aluminum alloy components with the above component and environment combinations in the steam and power conversion systems.

3.4.2.2.8 Loss of Material Due to General, Crevice, or Pitting Corrosion and Cracking Due to Stress Corrosion Cracking

SLRA section 3.4.2.2.8 (as amended by letter dated August 9, 2022 (ML22221A134), in response to RAI 3.4.2.2.8-1) is associated with SLRA table 3.4-1, AMR items 3.4-1, 051 and 3.4-1, 082, which address (1) loss of material due to general, crevice, or pitting corrosion in steel piping and piping components exposed to concrete (item 3.4-1, 051), and (2) loss of material due to crevice or pitting corrosion and cracking due to SCC in stainless steel piping and piping components exposed to concrete (item 3.4-1, 082). The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.4.2.2.8. SE section 3.3.2.2.9 documents the staff's evaluation for the component associated with item 3.4-1, 051 (i.e., the Unit 2 condensate storage tank).

In the review of components associated with item 3.4-1, 082, the staff noted that SLRA section 3.4.2.2.8 states that "[s]tainless steel piping exposed to soil or concrete are assumed to be subject to wetting and the Buried and Underground Piping and Tanks (B.2.3.27) AMP is used to manage loss of material and cracking." The staff finds that the applicant has met the further evaluation criteria and that the applicant's proposal to manage the effects of aging using the buried and underground piping and tanks program is acceptable because the periodic visual or volumetric inspections performed as part of this program are capable of detecting loss of material and cracking in stainless steel piping.

Based on the program identified, the staff concludes that the applicant's program meets the SRP-SLR section 3.4.2.2.8 criteria. For those AMR items associated with SLRA section 3.4.2.2.8, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.9 Loss of Material Due to Pitting and Crevice Corrosion in Aluminum Alloys

SLRA section 3.4.2.2.9 is associated with SLRA table 3.4-1, AMR item 3.4-1, 035, which addresses loss of material due to pitting or crevice corrosion for aluminum piping, piping components, and tanks exposed to air or condensation, which will be managed by the external surfaces monitoring of mechanical components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.4.2.2.9.

In the review of components associated with AMR item 3.4-1, 035, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging for AMR item 3.4-1, 035 using the external surfaces monitoring of mechanical components program is acceptable because the periodic inspections conducted as part of this program are capable of detecting whether loss of material is occurring.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-SLR section 3.4.2.2.9 criteria. For those AMR items associated with SLRA section 3.4.2.2.9, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

SLRA section 3.4.2.2.9 is also associated with SLRA table 3.4-1, AMR items 3.4-1, 094, 3.4-1, 097, 3.4-1, 119, and 3.4-1, 120, which address loss of material due to pitting or crevice corrosion for underground aluminum piping, piping components, and tanks; aluminum tanks within the scope of GALL-SLR AMP X.M29 that are exposed to air or condensation; insulated aluminum piping, piping components, and tanks exposed to air or condensation; and aluminum piping, piping components, and tanks exposed to raw water or wastewater. The applicant stated that these items are not applicable. Having evaluated the applicant's claim against the criteria in SRP-SLR section 3.4.2.2.9, the staff finds it acceptable, because a review of the UFSAR and SLRA confirms that there are no aluminum alloy components with the above component and environment combinations in the steam and power conversion systems.

3.4.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

3.4.2.3.1 Main Steam

Copper Alloy with Greater than 15 Percent Zinc Valve Bodies Exposed to Air-Outdoor. The staff's evaluation for copper alloy with greater than 15 percent zinc valve bodies exposed to outdoor air, which will be managed for loss of material due to selective leaching by the selective leaching program and are associated with generic note H, is documented in SE section 3.3.2.3.1.

3.5 Aging Management of Containments, Structures, and Component Supports

3.5.1 Summary of Technical Information in the Application

SLRA section 3.5 provides AMR results for those components the applicant identified in SLRA section 2.4, "Scoping and Screening Results: Structures," as being subject to an AMR. SLRA table 3.5-1, "Summary of Aging Management Evaluation for Containments, Structures and Component Supports," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for the containments, structures, and component supports components.

3.5.2 Staff Evaluation

Table 3.5-1 below summarizes the staff's evaluation of the component groups listed in SLRA section 3.5 and addressed in the GALL-SLR Report.

Table 3.5-1 Staff Evaluation for Containments, Structures, and Component Supports Components in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
Component Group (SRP-SLR Item No.)	**Staff Evaluation**
3.5-1, 001	Not applicable to PSL (see SE section 3.5.2.2.1.1)
3.5-1, 002	Not applicable to PSL (see SE section 3.5.2.2.1.1)
3.5-1, 003	Not applicable to PSL (see SE section 3.5.2.2.1.2)
3.5-1, 004	Not applicable to PWRs (see SE section 3.5.2.2.1.3, item 1)
3.5-1, 005	Consistent with the GALL-SLR Report (see SE section 3.5.2.2.1.3, item 1)
3.5-1, 006	Not applicable to PWRs (see SE section 3.5.2.2.1.3, item 2)
3.5-1, 007	Not applicable to PWRs (see SE section 3.5.2.2.1.3, item 3)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5-1, 008	Not applicable to PSL (see SE section 3.5.2.2.1.4)
3.5-1, 009	Consistent with the GALL-SLR Report (see SE section 3.5.2.2.1.5)
3.5-1, 010	Consistent with the GALL-SLR Report (see SE section 3.5.2.2.1.6)
3.5-1, 011	Not applicable to PSL (see SE section 3.5.2.2.1.7)
3.5-1, 012	Consistent with the GALL-SLR Report (see SE section 3.5.2.2.1.8)
3.5-1, 013	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5-1, 014	Consistent with the GALL-SLR Report (see SE section 3.5.2.2.1.9)
3.5-1, 015	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5-1, 016	Not applicable to PSL (see SE section 3.5.2.1.1)
3.5-1, 017	This item number is not used in the SRP-SLR nor the GALL-SLR Report
3.5-1, 018	Not applicable to PSL (see SE section 3.5.2.1.1)
3.5-1, 019	Consistent with the GALL-SLR Report (see SE section 3.5.2.1.1)
3.5-1, 020	Not applicable to PSL (see SE section 3.5.2.1.1)
3.5-1, 021	Consistent with the GALL-SLR Report
3.5-1, 022	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5-1, 023	Consistent with the GALL-SLR Report
3.5-1, 024	Consistent with the GALL-SLR Report
3.5-1, 025	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5-1, 026	Consistent with the GALL-SLR Report 12
3.5-1, 027	Not applicable to PSL (see SE section 3.5.2.2.1.5)
3.5-1, 028	Consistent with the GALL-SLR Report
3.5-1, 029	Consistent with the GALL-SLR Report
3.5-1, 030	Consistent with the GALL-SLR Report
3.5-1, 031	Consistent with the GALL-SLR Report
3.5-1, 032	Not applicable to PSL (see SE section 3.5.2.1.1)
3.5-1, 033	Consistent with the GALL-SLR Report
3.5-1, 034	Consistent with the GALL-SLR Report
3.5-1, 035	Consistent with the GALL-SLR Report (see SE section 3.5.2.2.1.3, item 1)
3.5-1, 036	Not applicable to PWRs
3.5-1, 037	Not applicable to PWRs
3.5-1, 038	Not applicable to PWRs (see SE section 3.5.2.2.1.6)
3.5-1, 039	Not applicable to PWRs (see SE section 3.5.2.2.1.6)
3.5-1, 040	Not applicable to PWRs
3.5-1, 041	Not applicable to PWRs
3.5-1, 042	Not applicable to PSL (see SE section 3.5.2.2.2.1, item 1)
3.5-1, 043	Consistent with the GALL SLR Report (see SE section 3.5.2.2.2.1, item 2)
3.5-1, 044	Consistent with the GALL SLR Report (see SE section 3.5.2.2.2.1, item 3)
3.5-1, 045	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5-1, 046	Not applicable to PSL (see SE section 3.5.2.2.2.1, item 3)
3.5-1, 047	Consistent with the GALL SLR Report (see SE section 3.5.2.2.2.1, item 4)
3.5-1, 048	Not applicable to PSL (see SE section 3.5.2.2.2.2)
3.5-1, 049	Not applicable to PSL (see SE section 3.5.2.2.2.3, item 1)
3.5-1, 050	Consistent with the GALL-SLR Report (see SE section 3.5.2.2.2.3, item 2)
3.5-1, 051	Consistent with the GALL-SLR Report (see SE section 3.5.2.2.2.3, item 3)
3.5-1, 052	Not applicable to PSL (see SE section 3.5.2.2.2.4)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5-1, 053	Not applicable to PSL (see SE section 3.5.2.2.2.5)
3.5-1, 054	Consistent with the GALL-SLR Report (see SE section 3.5.2.1.2 for generic note E items)
3.5-1, 055	Consistent with the GALL-SLR Report
3.5-1, 056	Consistent with the GALL-SLR Report
3.5-1, 057	Consistent with the GALL-SLR Report
3.5-1, 058	Consistent with the GALL-SLR Report
3.5-1, 059	Consistent with the GALL-SLR Report
3.5-1, 060	Not applicable to PSL (see SE section 3.5.2.1.1)
3.5-1, 061	Consistent with the GALL-SLR Report
3.5-1, 062	Not applicable to PSL (see SE section 3.5.2.1.1)
3.5-1, 063	Consistent with the GALL-SLR Report (see SE section 3.5.2.1.3 for generic note E items)
3.5-1, 064	Not applicable to PSL (see SE section 3.5.2.1.1)
3.5-1, 065	Consistent with the GALL-SLR Report (see SE section 3.5.2.1.4 for generic note E items)
3.5-1, 066	Consistent with the GALL-SLR Report (see SE section 3.5.2.1.4 for generic note E items)
3.5-1, 067	Consistent with the GALL-SLR Report (see SE section 3.5.2.1.5 for generic note E items)
3.5-1, 068	Consistent with the GALL-SLR Report
3.5-1, 069	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5-1, 070	Consistent with the GALL-SLR Report (see SE section 3.5.2.1.6 for generic note E items)
3.5-1, 071	Not applicable to PSL (see SE section 3.5.2.1.1)
3.5-1, 072	Consistent with the GALL-SLR Report
3.5-1, 073	Consistent with the GALL-SLR Report
3.5-1, 074	Not used - addressed by 3.5-1, 075 (see SE section 3.5.2.1.1)
3.5-1, 075	Consistent with the GALL-SLR Report
3.5-1, 076	Not applicable PWRs
3.5-1, 077	Consistent with the GALL-SLR Report (see SE section 3.5.2.1.7 for generic note E items)
3.5-1, 078	Consistent with the GALL-SLR Report
3.5-1, 079	Consistent with the GALL-SLR Report
3.5-1, 080	Consistent with the GALL-SLR Report
3.5-1, 081	Not used – addressed by 3.5-1, 091 (see SE section 3.5.2.1.1)
3.5-1, 082	Consistent with the GALL-SLR Report (see SE section 3.5.2.1.8 for generic note E items)
3.5-1, 083	Not used – addressed by 3.5-1, 080 (see SE section 3.5.2.1.1)
3.5-1, 084	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5-1, 085	Not applicable to PSL (see SE section 3.5.2.1.1)
3.5-1, 086	Consistent with the GALL-SLR Report
3.5-1, 087	Consistent with the GALL-SLR Report
3.5-1, 088	Consistent with the GALL-SLR Report
3.5-1, 089	Consistent with the GALL-SLR Report
3.5-1, 090	Not applicable to PSL (see SE section 3.5.2.1.1)
3.5-1, 091	Consistent with the GALL-SLR Report
3.5-1, 092	Consistent with the GALL-SLR Report (see SE section 3.5.2.1.9 for generic note E items)
3.5-1, 093	Consistent with the GALL-SLR Report
3.5-1, 094	Not applicable to PSL (see SE section 3.5.2.1.1)
3.5-1, 095	Consistent with the GALL-SLR Report
3.5-1, 096	Consistent with the GALL-SLR Report
3.5-1, 097	Not applicable to PSL (see SE section 3.5.2.2.2.6)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5-1, 098	Consistent with the GALL-SLR Report
3.5-1, 099	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.4)
3.5-1, 100	Consistent with the GALL-SLR Report (see SE section 3.2.2.2.4)

The staff's review of component groups, as described in SE section 3.0.2.2, is summarized in the following three sections:

(1) SE section 3.5.2.1 discusses AMR results for components that the applicant states are either not applicable to PSL or are consistent with the GALL-SLR Report. Section 3.5.2.1.1 summarizes the staff's review of items that are not applicable or not used and documents any RAIs issued and the staff conclusions. The remaining subsections in SE section 3.5.2.1 document the review of components that required additional information or otherwise require explanation.

(2) SE section 3.5.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

(3) SE section 3.5.2.3 discusses AMR results for components that the applicant states are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the SLRA.

3.5.2.1 Aging Management Review Results Consistent with the GALL-SLR Report

The following subsections document the staff's review of AMR results listed in SLRA tables 3.5.2-1 through 3.5.2-18 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat the review of the matters described in the GALL-SLR Report; however, the staff did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-SLR Report, and for which no additional evaluation or request for additional information applies, the staff's review and conclusions as documented in the GALL-SLR Report are considered to be the basis for acceptability of the AMR item. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SE table 3.5-1, and no separate writeup is required or provided. For AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in sections 3.5.2.1.2 through 3.5.2.1.9 below.

SE section 3.5.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable or not used.

3.5.2.1.1 Aging Management Review Results Identified as Not Applicable or Not Used

For SLRA table 3.5-1, items 3.5-1, 001; 3.5-1, 002; 3.5-1, 003; 3.5-1, 008; 3.5-1, 011; 3.5-1, 016; 3.5-1, 018; 3.5-1, 020; 3.5-1, 027; 3.5-1, 032; 3.5-1, 042; 35-1, 046; 3.5-1, 048; 3.5-1, 049; 3.5-1, 052; 3.5-1, 053; 3.5-1, 062; 3.5-1, 071; 3.5-1, 085; 3.5-1, 090; 3.5-1, 094; and 3.5-1, 097, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to PSL. The staff reviewed the SLRA, description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents and has confirmed the applicant's claim.

For SLRA table 3.5-1, items 3.5-1, 004; 3.5-1, 006; 3.5-1, 007; 3.5-1, 036; 3.5-1, 037; 3.5-1, 038; 3.5-1, 039; 3.5-1, 040; 3.5-1, 041; and 3.5-1, 076, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items are only applicable to boiling-water reactors (BWRs). The staff reviewed the SRP-SLR, confirmed that these items only apply to BWRs, and finds that these items are not applicable to PSL because it is a PWR.

SLRA table 3.5-1, AMR item 3.5-1, 019 addresses cracking from reactions with aggregate for accessible reinforced concrete containment structures exposed to any environment. The applicant stated that this item is not applicable because PSL does not have a reinforced concrete containment, and that the structures monitoring program manages cracking for shield building (SB) concrete as addressed by item 3.5-1, 054. The staff evaluated the applicant's not applicable claim and noted that, contrary to the claim, item 3.5-1, 019 is credited in SLRA table 3.5.2-1 for managing cracking of accessible subfoundation/basemat concrete using the structures monitoring AMP. By SLRA Supplement 1 dated April 7, 2022 (ML22097A202), the applicant corrected this inconsistency by revising SLRA table 3.5-1, item 3.5-1, 019 to be applicable and consistent with NUREG-2191. The staff finds SLRA table 3.5-1, item 3.5-1, 019, as modified by SLRA Supplement 1, acceptable because it aligns with the GALL-SLR Report guidance, and the structures monitoring program properly addresses this aging effect, material, and environment combination.

SLRA table 3.5-1, AMR item 3.5-1, 060, addresses managing loss of material (spalling, scaling) and cracking due to freeze-thaw for the accessible concrete areas in Group 6 structures exposed to any environment. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because PSL is located in a negligible weathering region (subtropical climate) as shown in American Society for Testing and Materials (ASTM) C33-90, figure 1, and the accessible concrete elements of Group 6 structures are not exposed to freeze-thaw weathering conditions required for this aging effect to occur.

SLRA table 3.5-1, AMR item 3.5-1,064, addresses managing loss of material (spalling, scaling) and cracking due to freeze-thaw for the accessible concrete areas of exterior above and below grade, and foundation structures in Groups 1-3, 5, and 7-9 exposed to the air-outdoor environment. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because PSL is located in a negligible weathering region (subtropical climate) as shown in ASTM C33-90, figure 1, and the accessible concrete elements of Groups 1-3, 5, and 7-9 structures are not exposed to the freeze-thaw weathering conditions required for this aging effect to occur.

SLRA table 3.5-1, AMR item 3.5-1, 074, addresses managing loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear in the sliding support bearings, and sliding support surfaces exposed to air-indoor uncontrolled or air-outdoor environments. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because this line item is not used, and its aging effect of loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear in the sliding support bearings, and sliding support surfaces exposed to air-indoor uncontrolled or air-outdoor environments is managed by the ASME section XI, subsection IWF program and addressed under AMR item 3.5-1, 075.

SLRA table 3.5-1, item 3.5-1, 081, as amended by Supplement 1 dated April 7, 2022 (ML22097A202), addresses loss of material due to general, pitting, crevice corrosion for steel structural bolting exposed to air-indoor uncontrolled and air-outdoor environments. The applicant stated that this item is not used, and bolting for ASME Class 1, 2, and 3 supports is evaluated with item 3.5-1, 091. The staff evaluated the applicant's claim and finds it acceptable because the ASME structural bolting exposed to air-indoor uncontrolled and air-outdoor environments is managed by the ASME section XI, subsection IWF program and addressed under AMR item 3.5.1, 091.

SLRA table 3.5-1, AMR item 3.5.1, 083, addresses loss of material due to general, pitting, crevice corrosion for steel structural bolting exposed to air-indoor uncontrolled and air-outdoor environments. The applicant stated that this item is not used. The staff evaluated the applicant's claim and finds it acceptable because the structural bolting exposed to air-indoor uncontrolled and air-outdoor environments is managed by the structures monitoring program and addressed under AMR item 3.5.1, 080.

3.5.2.1.2 Cracking Due to Chemical Reactions

SLRA table 3.5-1, AMR item 3.5-1, 054 addresses cracking due to expansion from reactions with aggregates for concrete elements in accessible areas of Groups 1-3, 5, and 7-9 structures exposed to any environment, which will be managed by the structures monitoring program. The SLRA claims that AMR item 3.5.1-054 is consistent with NUREG-2191. The staff reviewed the SLRA table 2 AMR items associated with AMR item 3.5-1, 054 for concrete elements in accessible areas of Groups 1-3, 5, and 7-9 structures and confirmed that AMR item 3.5-1, 054 is consistent with NUREG-2191.

For the SLRA table 2 AMR items, as modified by SLRA Supplement 1 (ML22097A202), that cite generic note E, the SLRA credits the fire protection program to manage the aging effects of cracking due to chemical reactions for the accessible concrete elements that serve as fire barriers and will be managed by the fire protection program. In addition, the AMR items cite plant-specific note 3 (tables 3.5.2-4, 3.5.2-5, 3.5.2-6, and 3.5.2-11), or note 4 (table 3.5.2-10), which state, "Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire barrier function on certain fire barriers in the yard recognizing that other barriers in the yard have additional functions that are managed by the Structures Monitoring AMP or related AMP."

Based on the review of components associated with AMR item 3.5-1, 054, for which the applicant cited generic note E, as modified by SLRA Supplement 1 (ML22097A202) and response to RAI B.2.3.15-6 (ML22192A078), the staff finds the applicant's proposal to manage the effects of aging using the fire protection program acceptable because the periodic visual inspections that the fire protection program requires are capable of detecting cracking due to chemical reactions prior to the loss of the fire barrier intended function. In addition, both fire protection program and structures monitoring program management of aging effects for concrete structural fire barriers are consistent with GALL-SLR Report recommendations. The SLRA also credits the structures monitoring program to manage the aging effects of cracking due to expansion from reactions with aggregates for these accessible concrete elements.

3.5.2.1.3 Loss of Material Due to Delamination, Exfoliation, Spalling, Popout, and Scaling

SLRA table 3.5-1, AMR item 3.5-1, 063 addresses increases in porosity and permeability, loss of strength due to leaching of calcium hydroxide, and carbonation for concrete elements in accessible areas of Groups 1-3, 5, and 7-9 structures exposed to a water-flowing environment, which will be managed by the structures monitoring program. The SLRA claims that AMR item 3.5-1, 063 is consistent with NUREG-2191. The staff reviewed the SLRA table 2 AMR items associated with AMR item 3.5-1, 063 for concrete elements in accessible areas of Groups 1-3, 5, and 7-9 structures and confirmed that AMR item 3.5-1, 054 is consistent with NUREG-2191.

For the SLRA table 2 AMR items that cite generic note E, the SLRA credits the fire protection program to manage the aging effects of loss of material due to delamination, exfoliation, spalling, popout, and scaling for the accessible concrete elements that serve as fire barriers and will be managed by the fire protection program. In addition, the AMR items cite plant specific note 3 (tables 3.5.2-4, 3.5.2-5, 3.5.2-6, and 3.5.2-11), or note 4 (table 3.5.2-10), which state, "Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire barrier function on certain fire barriers in the yard recognizing that other barriers in the yard have additional functions that are managed by the Structures Monitoring AMP or related AMP."

Based on the review of components associated with AMR item 3.5-1, 063, for which the applicant cited generic note E, as modified by SLRA Supplement 1 (ML22097A202), the staff finds the applicant's proposal to manage the effects of aging using the fire protection program acceptable because the periodic visual inspections that the fire protection program requires are capable of detecting loss of material due to delamination, exfoliation, spalling, popout, and scaling prior to the loss of the fire barrier intended function. In addition, both fire protection program and structures monitoring program management of aging effects for concrete structural fire barriers are consistent with GALL-SLR Report recommendations. The SLRA also credits the structures monitoring program to manage the aging effects of increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation for these accessible concrete elements.

3.5.2.1.4 Cracking and Loss of Material (Spalling, Scaling) Due to Corrosion of Reinforcement

SLRA table 3.5-1, AMR item 3.5-1, 065 addresses cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for concrete elements in the accessible and inaccessible areas of Groups 1-3, 5, and 7-9 structures, and the inaccessible areas of Group 6 structures exposed to air-indoor uncontrolled and air-outdoor or groundwater and soil environments, which the Structures Monitoring program will manage. The SLRA claims that AMR item 3.5-1, 065 is consistent with NUREG-2191. The staff reviewed the SLRA table 2 AMR items associated with AMR item 3.5.1, 065 for concrete elements in accessible and inaccessible areas of Groups 1-3, 5, and 7-9 structures and inaccessible areas of Group 6 structures and confirmed that AMR item 3.5-1, 065 is consistent with NUREG-2191.

For the SLRA table 2 AMR items, as modified by SLRA Supplement 1 (ML22097A202), that cite generic note E, the SLRA credits the fire protection program to manage the aging effects of cracking and loss of material (spalling, scaling) due to corrosion of reinforcement for the inaccessible concrete elements that serve as fire barriers and will be managed by the fire protection program. In addition, the AMR items cite plant-specific note 3 (tables 3.5.2-4, 3.5.2-5, 3.5.2-6, and 3.5.2-11), or note 4 (table 3.5.2-10), which state, "Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire barrier function on certain fire barriers in the yard recognizing that other barriers in the yard have additional functions that are managed by the Structures Monitoring AMP or related AMP."

Based on the review of components associated with AMR item 3.5-1, 065, for which the applicant cited generic note E, as modified by SLRA Supplement 1 (ML22097A202), the staff finds the applicant's proposal to manage the effects of aging using the fire protection program acceptable because the fire protection program will work in conjunction with the structures monitoring program to detect the effects of aging for the inaccessible concrete elements prior to the loss of the intended functions. Both fire protection program and structures monitoring program management of aging effects for concrete structural fire barriers is consistent with GALL-SLR Report recommendations. The SLRA also credits the structures monitoring program to manage the aging effects of cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for these concrete elements.

SLRA table 3.5-1, AMR item 3.5-1, 066 addresses cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for concrete elements in accessible areas of Groups 1-5, 7, and 9 exposed to air-indoor uncontrolled or air-outdoor environments, which the structures monitoring program will manage. The SLRA claims that AMR item 3.5-1, 066 is consistent with NUREG-2191. The staff reviewed the SLRA table 2 AMR items associated with AMR item 3.5-1, 066 for concrete elements in accessible areas of Groups 1-3, 5, 7, and 9 structures and confirmed that AMR item 3.5-1, 066 is consistent with NUREG-2191.

For the SLRA table 2 AMR items that cite generic note E, the SLRA credits the fire protection program to manage the aging effects of cracking and loss of material (spalling, scaling) due to corrosion of reinforcement for the accessible concrete elements, which serve as fire barriers and will be managed by the fire protection program. In addition, the AMR items cite plant-specific note 3 (tables 3.5.2-4, 3.5.2-5, 3.5.2-6, and 3.5.2-11), or note 4 (table 3.5.2-10), which state, "Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire barrier function on certain fire barriers in the yard recognizing that other barriers in the yard have additional functions that are managed by the Structures Monitoring AMP or related AMP," or; note 3 (table 3.5.2-13), which states, "Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire prevention function on curbs in the turbine building with a fire prevention intended function."

Based on the review of components associated with AMR item 3.5-1, 066, for which the applicant cited generic note E, as modified by SLRA Supplement 1 (ML22097A202) and response to RAI B.2.3.15-6 (ML22192A078), the staff finds the applicant's proposal to manage the effects of aging using the fire protection program acceptable because the periodic visual inspections that the fire protection program requires are capable of detecting cracking and loss of material (spalling, scaling) due to corrosion of reinforcements prior to loss of the fire barrier intended function. In addition, both fire protection program and structures monitoring program management of aging effects for concrete structural fire barriers is consistent with GALL-SLR Report recommendations. The SLRA also credits the structures monitoring program to manage the aging effects of cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for these accessible concrete elements.

3.5.2.1.5 Cracking and Loss of Material (Spalling, Scaling) Due to Chemical Reactions

SLRA table 3.5-1, AMR item 3.5-1, 067 addresses increases in porosity and permeability, cracking, and loss of material (spalling, scaling) due to aggressive chemical attacks for accessible concrete elements of Groups 1-5, 7, and 9; inaccessible concrete elements of Groups 1-5, 7, and 9; and inaccessible concrete elements of Group 6 structures exposed to air-indoor uncontrolled, air-outdoor, or groundwater and soil environments, which the structures monitoring program will manage. The SLRA claims that AMR item 3.5-1, 067 is consistent with NUREG-2191. The staff reviewed the SLRA table 2 AMR items associated with AMR item 3.5-1, 067 for accessible concrete elements of Groups 1-5, 7, and 9; inaccessible concrete elements of Groups 1-5, 7, and 9; and inaccessible concrete elements of Group 6 structures and confirmed that AMR item 3.5-1, 067 is consistent with NUREG-2191.

For the SLRA table 2 AMR items, as modified by SLRA Supplement 1 (ML22097A202), that cite generic note E, the SLRA credits the fire protection program to manage the aging effects of cracking and loss of material (spalling, scaling) due to chemical reactions for the accessible and inaccessible concrete elements that serve as fire barriers and will be managed by the fire protection program. In addition, the AMR items cite plant-specific notes 3 (tables 3.5.2-4, 3.5.2-5, 3.5.2-6, and 3.5.2-11) or 4 (table 3.5.2-10), which state, “Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire barrier function on certain fire barriers in the yard recognizing that other barriers in the yard have additional functions that are managed by the Structures Monitoring AMP or related AMP,” or “Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire prevention function on curbs in the turbine building with a fire prevention intended function.”

Based on the review of components associated with AMR item 3.5-1, 067, for which the applicant cited generic note E, as modified by SLRA Supplement 1 (ML22097A202) and response to RAI B.2.3.15-6 (ML22192A078), the staff finds the applicant’s proposal to manage the effects of aging using the fire protection program acceptable because (1) the periodic visual inspections that the fire protection program requires are capable of detecting cracking and loss of material (spalling, scaling) due to chemical reactions for the accessible concrete elements prior to loss of the fire barrier intended function, and (2) the fire protection program will work in conjunction with the structures monitoring program to detect the effects of aging for the inaccessible concrete elements prior to the loss of the intended functions. Both fire protection program and structures monitoring program management of aging effects for concrete structural fire barriers is consistent with the GALL-SLR Report recommendations. The SLRA also credits the structures monitoring program to manage the aging effects of increases in porosity and permeability, cracking, and loss of material (spalling, scaling) due to aggressive chemical attacks for these concrete elements.

3.5.2.1.6 Cracking due to restraint shrinkage, creep, and aggressive environments

SLRA table 3.5.1, AMR item 3.5.1-070, as amended by Supplement 1 dated April 7, 2022 (ML22097A202), addresses cracking due to restraint shrinkage, creep, and aggressive environments for concrete block masonry walls exposed to indoor uncontrolled air and outdoor air. For the SLRA table 2 AMR items, as amended by Supplement 1 dated April 7, 2022 (ML22097A202), that cite generic note E, the SLRA credits the fire protection program to manage the aging effects for reinforced and unreinforced concrete masonry block walls that act as structural fire barriers. The AMR items cite plant-specific note 5, which states, “Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Masonry Walls AMP, is credited with managing the fire barrier function on certain fire barriers in the yard recognizing that other barriers in the yard have additional functions that are managed by the Masonry Walls AMP or related AMP."

Based on the review of components associated with AMR item 3.5.1-070 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the fire protection program acceptable because, in addition to the fire protection program that manages cracking for structural fire barriers, the masonry walls program is also credited for the associated masonry block walls to manage cracking due to restraint shrinkage, creep, and aggressive environments, which is consistent with the GALL-SLR Report recommendations.

3.5.2.1.7 Loss of Material Due to Corrosion

SLRA table 3.5-1, AMR item 3.5-1, 077 addresses loss of material due to corrosion for all structural steel exposed to air-indoor uncontrolled or air-outdoor environments. For the SLRA table 2 AMR items that cite generic note E, the SLRA credits the fire protection program to manage the aging effect for miscellaneous steel that serves as a fire barrier and will be managed by the fire protection program. In addition, the AMR items cite plant-specific note 3 (tables 3.5.2-4, 3.5.2-5, 3.5.2-6, and 3.5.2-11), or note 4 (table 3.5.2-10), which state, "Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire barrier function on certain fire barriers in the yard recognizing that other barriers in the yard have additional functions that are managed by the Structures Monitoring AMP or related AMP."

Based on the review of components associated with AMR item 3.5-1, 077 for which the applicant cited generic note E, as modified by SLRA Supplement 1 (ML22097A202), the staff finds the applicant's proposal to manage the effects of aging using the fire protection program acceptable because the periodic visual inspections that the fire protection program requires are capable of detecting loss of material due to corrosion prior to loss of the fire barrier intended function. In addition, both fire protection program and structures monitoring program management of aging effects for structural steel fire barriers are consistent with GALL-SLR Report recommendations. The SLRA also credits the structures monitoring program to manage the aging effects of loss of material due to corrosion for these components that also have a structural intended function, which is consistent with GALL-SLR Report recommendations.

3.5.2.1.8 Loss of Material Due to General, Pitting, Crevice Corrosion

SLRA table 3.5-1, AMR item 3.5-1, 082 addresses loss of material due to general, pitting, crevice corrosion for structural bolting exposed to air-outdoor environments. For the SLRA table 2 AMR items that cite generic note E, the SLRA credits the fire protection program to manage the aging effect for miscellaneous steel that serves as fire barrier and will be managed by the fire protection program. In addition, the AMR items cite plant-specific note 3, which states, "Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire barrier function on certain fire barriers in the yard recognizing that other barriers in the yard have additional functions that are managed by the Structures Monitoring AMP or related AMP."

Based on the review of components associated with AMR item 3.5-1, 082 for which the applicant cited generic note E, as modified by SLRA Supplement 1 (ML22097A202), the staff finds the applicant’s proposal to manage the effects of aging using the fire protection program acceptable because the periodic visual inspections that the fire protection program requires are capable of detecting loss of material due to general, pitting, crevice corrosion prior to loss of the fire barrier intended function. The SLRA also credits the structures monitoring program to manage the aging effects of loss of material due to general, pitting, crevice corrosion for these components that also have a structural intended function, which is consistent with GALL-SLR Report recommendations.

3.5.2.1.9 Loss of Material Due to General, Pitting Corrosion

SLRA table 3.5-1, AMR item 3.5-1, 092 addresses loss of material due to general, pitting corrosion for support members, welds, bolted connections, and support anchorage to building structures exposed to air-indoor uncontrolled or air-outdoor environments. For the SLRA table 2 AMR items that cite generic note E, the SLRA credits the fire protection program to manage the aging effects for the carbon-steel plate fire-sealed isolation joint. In addition, the table 2 AMR items cite plant-specific note 1, which states, “Metal components of fire barrier assemblies will be managed by the Fire Protection AMP.”

Based on the review of components associated with AMR item 3.5-1, 092 for which the applicant cited generic note E, the staff finds the applicant’s proposal to manage the effects of aging using the fire protection program acceptable because the periodic visual inspections that the fire protection program requires are capable of detecting loss of material due to general and pitting corrosion prior to loss of the fire barrier intended function.

3.5.2.2 Aging Management Review Results for which Further Evaluation Is Recommended by the GALL-SLR Report

In SLRA section 3.5.2.2, the applicant further evaluated aging management for certain containment, structures, and component supports components, as recommended by the GALL-SLR Report, and provides information concerning how it will manage the applicable aging effects. The NRC staff reviewed the applicant’s evaluation of these component groups against the criteria contained in SRP-SLR section 3.5.2.2. The following subsections document the staff’s review.

3.5.2.2.1 Pressurized-Water Reactor and Boiling Water Reactor Containments

3.5.2.2.1.1 Cracking and Distortion Due to Increased Stress Levels from Settlement; Reduction of Foundation Strength and Cracking Due to Differential Settlement and Erosion of Porous Concrete Subfoundations

SLRA section 3.5.2.2.1.1, associated with SLRA table 3.5.1 AMR items 3.5-1, 001 and 3.5-1, 002, addresses cracking and distortion due to increased stress levels from settlement, and the reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundations, respectively, for containment concrete elements exposed to soil and flowing water environments. The SLRA notes that the aging effects associated with settlement (AMR item 3.5-1, 001) are not applicable because the initial settlement has ceased, and additional settlement is not expected based on the compacted fill below the foundation. However, the structures monitoring program will continue to monitor for cracks and distortion that could indicate settlement. Additionally, the aging effects associated with erosion of porous concrete subfoundations (AMR item 3.5-1, 002) are not applicable because the foundations are not constructed with porous foundations, and no dewatering system is used. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.5.2.2.1.1 and finds it acceptable because the applicant does not have porous concrete subfoundations or a dewatering system, and initial settlement has ceased. Additionally, the staff verified that the structures monitoring program will continue to monitor the structure for indications of settlement if it were to occur and noted that this aging effect is captured for the subfoundation by AMR item 3.5-1, 044 in SLRA table 3.5.2-1.

3.5.2.2.1.2 Reduction of Strength and Modulus Due to Elevated Temperature

SLRA section 3.5.2.2.1.2, associated with SLRA table 3.5-1, AMR item 3.5-1, 003 as modified by SLRA Supplement 1 (ML22097A202), addresses reduction of strength and modulus of elasticity due to elevated temperatures in concrete components (e.g., dome, wall, basemat, ring girders, buttresses, containment, and concrete fill-in annulus) of containment structures exposed to air-indoor uncontrolled or air-outdoor environments. The applicant stated that this AMR item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.5.2.2.1.2 and finds it acceptable because the concrete containment components are not exposed to the temperatures required for this aging effect to occur. In the review of the SLRA, and UFSAR sections 3.8.2.1.10 (Unit 1) and 3.8.2.1.1 (Unit 2), the staff noted that the containment air temperature during normal plant operation is less than or equal to 120°F, and localized hotspots from Type I and Type III mechanical penetrations at PSL Units 1 and 2 containment building structures are designed to be maintained below the degradation threshold temperature limits of the American Concrete Institute (ACI) standards (i.e., 150°F, except for local areas, such as around penetrations, which are allowed to have increased temperatures not to exceed 200°F). Therefore, the containment concrete is not expected to exceed the GALL-SLR Report recommended threshold limits of 150°F for general areas and 200°F for local areas, and plant operating experience (OE) has not identified any aging effects for containment concrete related to elevated temperatures.

3.5.2.2.1.3 Loss of Material Due to General, Pitting, and Crevice Corrosion

Item 1. SLRA section 3.5.2.2.1.3, item 1, associated with SLRA table 3.5-1, AMR items 3.5-1, 004; 3.5-1, 005; and 3.5-1, 035, addresses loss of material due to general, pitting, and crevice corrosion for inaccessible and accessible areas of drywell shells, drywell heads, and containment vessels (including liner anchors and integral attachments) of steel material exposed to an air-indoor uncontrolled environment. The applicant stated that item 3.5-1, 004 is not applicable as it applies to BWR containments only. For components associated with items 3.5-1, 005 and 3.5-1, 035, the applicant stated that the aging effects will be managed by the ASME section XI, subsection IWE, and 10 CFR part 50, appendix J AMPs. The staff reviewed the applicant's proposal, as modified by SLRA Supplement 1 dated April 7, 2022 (ML22097A202), against the criteria in SRP-SLR section 3.5.2.2.1.3, item 1.

The staff evaluated the applicant's non-applicability claim for SLRA table 3.5-1, AMR item 3.5-1, 004, and finds it acceptable because these AMR items only apply to BWR containment drywell shells, torus shells, and torus ring girders, and the PSL containments are PWR designs that do not incorporate drywell shells.

In the review of components associated with AMR items 3.5-1, 005 and 3.5-1, 035, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME section XI, subsection IWE, and 10 CFR part 50, appendix J AMPs is acceptable and a plant-specific AMP or enhancement is not necessary for the following reasons: (1) plant-specific OE with regard to corrosion associated with the containment steel vessel in accessible and inaccessible areas have been identified, evaluated, and repaired; (2) the design and construction of containment concrete has been in accordance with applicable ACI and ASTM standards to produce a dense, low-permeability concrete to protect against corrosion; (3) the ASME section XI, subsection IWE AMP inspects the moisture barrier between the containment vessel and concrete fill on the SB side and inside the containment vessel; (4) the structures monitoring program performs inspections to monitor concrete for penetrating cracks that could provide a pathway for water seepage to the surface of the containment vessel; plant-specific OE has revealed no such indications; and (5) the boric acid corrosion (BAC) AMP initiates evaluations and extent-of-condition assessments when potential leakage from borated water systems is discovered; any borated water spillage or water ponding on concrete floors is cleaned up or diverted to sumps in a timely manner when detected. Continued monitoring using the proposed AMPs provides reasonable assurance that any occurrence of corrosion of the containment steel vessel and its integral attachments will be identified and corrected prior to loss of intended function. Based on the programs identified, the staff concludes that the applicant's programs meet SRP-SLR section 3.5.2.2.1.3, item 1 criteria. For those AMR items associated with SLRA section 3.5.2.2.1.3, item 1, the staff concludes that the SLRA is consistent with the GALL-SLR Report, and that applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 2. SLRA section 3.5.2.2.1.3, item 2, associated with SLRA table 3.5-1, AMR item 3.5-1, 006, addresses loss of material for steel torus shells exposed to air-indoor uncontrolled or treated-water environments. The applicant stated that this item is not applicable as it applies to BWR containments only. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.5.2.2.1.3, item 2, and finds it acceptable because PSL containments are PWR designs that do not incorporate torus shells.

Item 3. SLRA section 3.5.2.2.1.3, item 3, associated with SLRA table 3.5-1, AMR item 3.5-1, 007, addresses loss of material for steel suppression chamber shells, steel torus rig girders, and steel downcomers exposed to air-indoor uncontrolled or treated-water environments. The applicant stated that this item is not applicable as it applies to BWR containments only. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.5.2.2.1.3, item 3, and finds it acceptable because PSL containments are PWR designs that do not incorporate torus, downcomers, or suppression chambers.

3.5.2.2.1.4 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature

SLRA section 3.5.2.2.1.4, associated with SLRA table 3.5-1, AMR item 3.5-1, 008, addresses loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperatures for prestressed concrete containments exposed to air-indoor uncontrolled and air-outdoor environments. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.5.2.2.1.4 and finds it acceptable because the PSL containments are stand-alone steel containments surrounded by reinforced concrete SBs that do not use prestressed tendons. Therefore, a TLAA for prestressed tendons in prestressed concrete containments is not necessary.

3.5.2.2.1.5 Cumulative Fatigue Damage

SLRA section 3.5.2.2.1.5, as amended by Supplement 1 (ML22097A202) and the response to RAI 4.6-1 (ML22192A078), associated with SLRA table 3.5-1, AMR item 3.5-1, 009, as amended, states that fatigue waiver TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1). The SLRA further states that the evaluation of these TLAAs for fatigue of the PSL Units 1 and 2 metal containment vessels; containment vessel penetration nozzles; equipment hatches and personnel air locks of carbon-steel, SS and nickel-alloy materials; and mechanical penetration assembly expansion bellows of SS material are addressed in SLRA section 4.6, as amended. This is consistent with SRP-SLR section 3.5.2.2.1.5 (as modified by SLR-ISG-2021-03-STRUCTURES (ML20181A381) and is, therefore, acceptable. The staff's evaluation regarding the TLAAs for metal containment vessels, vessel nozzles, equipment hatches and personnel air locks, and penetrations fatigue is documented in SE section 4.6.

SLRA table 3.5-1, AMR item 3.5-1, 027, as amended by Supplement 1, also associated with SLRA section 3.5.2.2.1.5, as amended, states that CLB fatigue analyses exist for PSL containment components susceptible to cracking due to cyclic loading and are addressed with item 3.5-1, 009; therefore, the line item 3.5-1, 027 is not applicable. The staff reviewed the non-applicability claim and finds it acceptable because the PSL containment pressure-retaining boundary components subject to cyclic loading have CLB fatigue analyses (as discussed in the previous paragraph), and the staff evaluation of these containment fatigue TLAAs is documented in SE section 4.6.

3.5.2.2.1.6 Cracking Due to Stress Corrosion Cracking

SLRA section 3.5.2.2.1.6, associated with SLRA table 3.5-1 AMR items 3.5-1, 010; 3.5-1, 038; and 3.5-1, 039, addresses cracking due to SCC for the PSL Units 1 and 2 SS fuel transfer tubes, expansion bellows, flanges, mechanical penetration expansion bellows, and the PSL Unit 2 electrical penetration dissimilar metal welds exposed to air-indoor uncontrolled environments, which will be managed by the ASME section XI, subsection IWE program, and the 10 CFR part 50, appendix J program. The staff reviewed the applicant's proposal, as modified by SLRA Supplement 1 (ML22097A202) and response to RAI 3.5.2.2.1.6-1 (ML22192A078), against the criteria in SRP-SLR section 3.5.2.2.1.6.

For components associated with AMR items 3.5-1, 038 and 3.5-1, 039, the applicant stated in SLRA table 3.5-1 that these items are not applicable because their applicability is for BWRs only. The staff evaluated the applicant's non-applicability claim for AMR items 3.5.1-038 and 3.5.1-039 and finds it acceptable because these items correspond to SRP-SLR table 3.5-1 items 3.5-1, 038 and 3.5-1, 039, which only apply to BWR containment suppression chamber shells and BWR vent line bellows, respectively, and the PSL containments are PWR designs that do not incorporate these components.

For components associated with AMR item 3.5-1, 010, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME section XI, subsection IWE and the 10 CFR part 50, appendix J AMPs, as modified by SLRA Supplement 1 (ML22097A202) and response to RAI 3.5.2.2.1.6-1 (ML22192A078), is acceptable because: (1) the ASME section XI, subsection IWE program will be enhanced by including supplemental one-time surface examinations (magnetic particle, dye penetrant), enhanced visual examinations (EVT-1 or equivalent), or crediting appropriate leak rate testing, which are all methods capable of detecting cracking due to SCC to confirm the absence of SCC aging effects; (2) the ASME section XI, subsection IWE program will be enhanced to include additional surface examinations, enhanced visual examinations, or credit leak rate tests performed at an appropriate frequency if SCC is identified as a result of the supplemental one-time inspections to ensure that aging effects of cracking due to SCC are adequately managed through the applicant's corrective action program; (3) the use of appropriate appendix J leak rate tests capable of detecting cracking as an alternative test method in lieu of surface or enhanced examination is consistent with the GALL-SLR Report recommendation; (4) the plant-specific OE has not identified cracking due to SCC associated with dissimilar metal welds or SS penetration bellows; and (5) the proposed programs with enhancements are consistent with the GALL-SLR Report recommendations to adequately manage this aging effect during the subsequent period of extended operation.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-SLR section 3.5.2.2.1.6 criteria. For those AMR items associated with SLRA section 3.5.2.2.1.6, as amended by SLRA Supplement 1 (ML22097A202) and response to RAI 3.5.2.2.1.6-1 (ML22192A078), the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.7 Loss of Material (Scaling, Spalling) and Cracking Due to Freeze-Thaw

SLRA section 3.5.2.2.1.7, associated with SLRA table 3.5-1, AMR item 3.5-1, 011, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw of inaccessible areas of containment concrete components exposed to air-outdoor or groundwater and soil environments. The applicant stated that this item is not applicable because the site is located in a subtropical climate with mild winters that do not expose the structures to significant freeze-thaw cycles. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.5.2.2.1.7 and finds it acceptable because the site is located in a negligible weathering region in accordance with ASTM Standard C33. In addition, the staff verified that the structures monitoring program will monitor accessible portions of the shield building concrete for cracking that could indicate freeze-thaw damage.

3.5.2.2.1.8 Cracking Due to Expansion from Reaction with Aggregates

SLRA section 3.5.2.2.1.8, associated with SLRA table 3.5-1 AMR item 3.5-1, 012 -, addresses cracking due to expansion from reaction with aggregates in inaccessible areas of containment concrete components exposed to any environment, which will be managed by the structures monitoring program. The staff reviewed the applicant's proposal, as amended by the response to RAI 3.5.2.2.2.1-2 (ML22192A078), against the criteria in SRP-SLR section 3.5.2.2.1.8.

During the review, the staff noted that the applicant's structures monitoring program includes guidance for visual inspections to detect indications of degradation due to reactive aggregates, including patterned cracking, darkened crack edges, water ingress, or misalignment of components. The staff also noted that the applicant has no OE with cracking that includes gel formation or dark discoloration, which are additional visual indications of alkali silica reaction (ASR).

The staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal, as modified by response to RAI 3.5.2.2.2.1-2, to manage the effects of aging using the structures monitoring program without a plant-specific program or enhancement is acceptable because plant OE has not identified indications of aggregate reactions in accessible areas, and the structures monitoring program includes inspections to detect indications of aggregate reactions. Any future indications of aggregate reactions in accessible areas will be evaluated to determine their possible impact on the acceptability of inaccessible areas.

Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR section 3.5.2.2.1.8 criteria. For those AMR items associated with SLRA section 3.5.2.2.1.8, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.9 Increase in Porosity and Permeability Due to Leaching of Calcium Hydroxide and Carbonation

SLRA section 3.5.2.2.1.9, associated with SLRA table 3.5-1 AMR item 3.5-1, 014, addresses increases in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of containment concrete components exposed to flowing water environments. The structures monitoring program will manage these aging effects. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.5.2.2.1.9.

During the review, the staff noted that leaching has been identified at PSL; however, the applicant has analyzed the leaching and determined that it is not significant and will not impact the structure's intended function (see SLRA section 3.5.2.2.2.1.4, as amended by Supplement 1, dated April 7, 2022 (ML22097A202)). In the review of components associated with AMR item 3.5.1, 014, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the structures monitoring program is acceptable because (1) the applicant's evaluation determined that the observed leaching of calcium hydroxide and carbonation in accessible areas has no impact on the intended function, and, therefore, a plant-specific AMP is not needed for inaccessible areas; (2) the structures monitoring program inspects for evidence of aging effects in accessible areas and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation to inaccessible areas; and (3) the structures monitoring program will perform opportunistic inspections of inaccessible below-grade concrete when excavated for any reason.

Based on the program identified, the staff concludes that the applicant's programs meet SRP-SLR section 3.5.2.2.1.9 criteria. For those AMR items associated with SLRA section 3.5.2.2.1.9, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

In SLRA Section 3.5.2.2, the applicant further evaluates aging management, as recommended in the GALL-SLR Report, for the containment, structures, and component supports components and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of component groups for which the GALL-SLR Report recommends further evaluation against the criteria contained in SRP-SLR section 3.5.2.2. The following subsections document the staff's review.

3.5.2.2.2.1 Aging Management of Inaccessible Areas

Item 1. SLRA section 3.5.2.2.2.1, item 1, associated with SLRA table 3.5-1, AMR item 3.5-1, 042, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures exposed to air-outdoor or groundwater and soil environments. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.5.2.2.1.1, item 1, and finds it acceptable because: (a) Groups 2 and 9 structures are not applicable to PSL since the PSL containments are PWR designs, and (b) PSL is located in a negligible weathering region (subtropical climate), as shown in ASTM C33-90, figure 1. Therefore, the concrete elements in below-grade inaccessible areas of Groups 1, 3, 5, 7, and 8 structures are not exposed to freeze-thaw weathering conditions required for this aging effect to occur; thus, a plant-specific program is not required to manage this aging effect.

Item 2. SLRA section 3.5.2.2.2.1, item 2, associated with SLRA table 3.5-1, item 3.5-1, 043, addresses cracking due to expansion from reactions with aggregates in inaccessible areas of Groups 1-3, 5, and 7-9 structures exposed to any environment, which will be managed by the structures monitoring program. The staff noted that Groups 2 and 9 structures are not applicable to PSL because the PSL containments are PWR designs. The staff reviewed the applicant's proposal, as modified by SLRA Supplement 1 (ML22097A202) and response to RAI 3.5.2.2.2.1-2 (ML22192A078), against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 2.

During the review, the staff noted that the structures monitoring program has been refined, based on industry and fleet information, to include visual examinations for patterned cracking, darkened crack edges, water ingress, and misalignment that would indicate reactions with aggregates, such as alkali silica reaction (ASR) and alkali carbonate reaction (ACR), and includes opportunistic inspection of inaccessible concrete locations. The staff noted that a plant-specific evaluation of possible ASR indications reasonably demonstrated that ASR was not occurring in the concrete structures at the plant site. The staff further noted that evaluations of accessible areas in the structures monitoring program provide the basis for extrapolation to the expected conditions of inaccessible areas and assessment of potential degradation in such areas.

The staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the structures monitoring program, as modified by the response to RAI 3.5.2.2.2.1-2 and Supplement 1 (ML22192A078 and ML22097A202, respectively) is acceptable because: (1) plant OE has not identified any indications of ASR for the concrete structures at the site, and therefore a plant-specific aging management program is not needed; (2) the refined inspections for ASR performed every 5 years under the structures monitoring program will be able to identify conditions that could indicate ASR in accessible areas; (3) the structures monitoring program provides evaluation of conditions in inaccessible areas if ASR is indicated in accessible areas.

In addition, SLRA section 3.5.2.2.2.1, item 2, associated with SLRA table 3.5-1, item 3.5-1, 043, addresses cracking due to chemical reactions for the inaccessible concrete foundations and basemats and exterior walls in the reactor auxiliary buildings exposed to groundwater and soil environments that serve as fire barriers and will be managed by the fire protection program. For the SLRA table 2 AMR item, as modified by SLRA Supplement 1 (ML22097A202) that cites generic note E, the SLRA credits the fire protection program to manage cracking due to chemical reactions for the inaccessible concrete foundations and basemats and exterior walls in the reactor auxiliary buildings that act as structural fire barriers. In addition, the AMR items cite plant-specific note 4, which states, “Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire barrier function on certain fire barriers in the yard recognizing that other barriers in the yard have additional functions that are managed by the Structures Monitoring AMP or related AMP.”

Based on the review of components associated with AMR item 3.5-1,043 for which the applicant cited generic note E, as modified by SLRA Supplement 1 (ML22097A202), the staff finds the applicant’s proposal to manage the effects of aging using the fire protection program acceptable because the fire protection program will work in conjunction with the structures monitoring program to detect the effects of aging for the inaccessible concrete elements prior to loss of the intended functions. Both the fire protection program and structures monitoring program management of aging effects for concrete structural fire barriers is consistent with GALL-SLR Report recommendations. The SLRA also credits the structures monitoring program with managing the aging effects of cracking due to expansion from reactions with aggregates for these concrete elements.

Based on the programs identified, the staff concludes that the applicant’s programs meet SRP-SLR section 3.5.2.2.2.1, item 2 criteria. For those AMR items associated with SLRA section 3.5.2.2.2.1, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA section 3.5.2.2.2.1, item 3, associated with SLRA table 3.5-1, item 3.5-1, 044, addresses cracking and distortion due to increased stress levels from settlement for the concrete elements of all structure groups exposed to a soil environment, which will be managed by the structures monitoring program. The staff reviewed the applicant’s proposal against the criteria in SRP-SLR section 3.5.2.2.2.1, item 3.

In the review of components associated with AMR item 3.5.1-044, the staff finds that the applicant has met the further evaluation criteria, and the applicant’s proposal to manage the effects of aging using the structures monitoring program is acceptable because the applicant does not credit a dewatering system that is relied on for settlement control at PSL, and the structures monitoring program looks for visual indications of settlement in accessible areas of concrete structures in accordance with GALL-SLR Report recommendations.

SLRA section 3.5.2.2.2.1, item 3, associated with SLRA table 3.5-1, item 3.5-1, 046, addresses reduction in foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundations in below-grade inaccessible concrete areas of Groups 1-3 and 5-9 structures exposed to water-flowing environments. The applicant stated that this item is not applicable. The staff evaluated the applicant’s claim against the criteria in SRP-SLR section 3.5.2.2.2.1, item 3, and finds it acceptable because the subfoundations are not constructed of porous concrete, and a dewatering system is not relied on to control groundwater levels. Therefore, the aging effects of reduction in foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundations are not probable aging effects at PSL; thus, a plant-specific program is not required to manage this aging effect.

In addition, SLRA section 3.5.2.2.2.1, item 3, associated with SLRA table 3.5-1, item 3.5-1, 044 addresses cracking due to settlement for the concrete slabs, walls, roofs, and trenches in the emergency diesel generator buildings, and concrete foundations and basemats and exterior walls in the reactor auxiliary buildings exposed to a soil environment that serve as fire barriers and will be managed by the fire protection program. For the SLRA table 2 AMR items that cite generic note E, the SLRA credits the fire protection program with managing the effects of aging for concrete elements, which act as structural fire barriers. In addition, the AMR items cite plant specific note 3 (tables 3.5.2-4, 3.5.2-5, 3.5.2-6, and 3.5.2-11), or note 4 (table 3.5.2-10), which state, "Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire barrier function on certain fire barriers in the yard recognizing that other barriers in the yard have additional functions that are managed by the Structures Monitoring AMP or related AMP."

Based on the review of components associated with AMR item 3.5.1-044 for which the applicant cited generic note E, the staff finds the applicant's proposal, as modified by SLRA Supplement 1 (ML22097A202), to manage the effects of aging using the fire protection program acceptable because the periodic visual inspections that the fire protection program requires are capable of detecting cracking due to settlement prior to loss of the fire barrier intended function. In addition, both fire protection program and structures monitoring program management of aging effects for concrete structural fire barriers are consistent with the GALL-SLR Report. The SLRA also credits the structures monitoring program to manage the aging effects of cracking and distortion due to increased stress levels from settlement for these concrete elements.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-SLR section 3.5.2.2.2.1, item 3 criteria. For those AMR items associated with SLRA section 3.5.2.2.2.1, item 3, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 4. SLRA section 3.5.2.2.2.1, item 4, associated with SLRA table 3.5-1, item 3.5-1, 047, addresses increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide, and carbonation for concrete elements in inaccessible areas of Groups 15 and 7-9 structures exposed to water-flowing environments, which will be managed by the structures monitoring program. The staff noted that Groups 2 and 9 structures are not applicable to PSL because the PSL containments are PWR designs. The applicant stated that a plant-specific AMP is not required to manage this aging effect in inaccessible areas of concrete components for Groups 1, 3-5, 7, and 8. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.5.2.2.2.1, item 4.

During the review, the staff noted that the structures monitoring program inspects for evidence of leaching of calcium hydroxide and carbonation in accessible concrete and inaccessible below-grade concrete when excavated for any reason. The staff also noted that the structures monitoring program includes the site-specific enhancement to conduct a baseline inspection of inaccessible concrete by excavation, visual inspection, and physical inspection of the inaccessible concrete through pH analysis and a chloride concentration test at a location close to the coastline or intake and a location in the main plant area for comparison to detect whether increases in porosity and permeability, loss of strength due to leaching of calcium hydroxide, or carbonation is occurring in a water-flowing environment. The staff further noted that the structures monitoring program requires evaluation of inspection results for the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation of inaccessible areas. In addition, the staff noted that although plant OE has identified evidence of leaching in accessible areas, the applicant's evaluation determined that the observed leaching did not adversely impact structural integrity or result in a loss of intended functions of the associated concrete structures.

In the review of components associated with item 3.5-1, 047, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the structures monitoring program is acceptable because (1) the applicant's evaluation determined that the observed leaching of calcium hydroxide and carbonation in accessible areas has no impact on the intended function, and, therefore, a plant-specific AMP is not needed for inaccessible areas; (2) the structures monitoring program inspects for evidence of aging effects in accessible areas and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation to inaccessible areas; and (3) the structures monitoring program will perform opportunistic inspections of inaccessible below-grade concrete when excavated for any reason.

In addition, SLRA section 3.5.2.2.2.1, item 4, associated with SLRA table 3.5-1, item 3.5-1, 047 addresses loss of material due to delamination, exfoliation, spalling, popout, or scaling for the inaccessible concrete elements exposed to water-flowing environments, which serve as fire barriers and will be managed by the fire protection program. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the fire protection program with managing the effects of aging for the inaccessible concrete elements that act as structural fire barriers. In addition, the AMR items cite plant specific note 3 (tables 3.5.2-4, 3.5.2-5, 3.5.2-6, and 3.5.2-11), or note 4 (table 3.5.2-10), which state, "Consistent with NUREG 2191 material, environment, and aging effect, but the Fire Protection AMP, in conjunction with the Structures Monitoring AMP, is credited with managing the fire barrier function on certain fire barriers in the yard recognizing that other barriers in the yard have additional functions that are managed by the Structures Monitoring AMP or related AMP."

Based on the review of components associated with AMR item 3.5-1, 047 for which the applicant cited generic note E, the staff finds the applicant's proposal, as modified by SLRA Supplement 1 (ML22097A202), to manage the effects of aging using the fire protection program acceptable because the fire protection program will work in conjunction with the structures monitoring program to detect the effects of aging for the inaccessible concrete elements prior to loss of the intended functions. Both fire protection and structures monitoring program management of aging effects for concrete structural fire barriers are consistent with the GALL-SLR Report recommendations. The SLRA also credits the structures monitoring program to manage the aging effects of increases in porosity and permeability, loss of strength due to leaching of calcium hydroxide, and carbonation for these concrete elements.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-SLR section 3.5.2.2.2.1, item 4 criteria. For those items associated with SLRA section 3.5.2.2.2.1, item 4, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.2 Reduction of Strength and Modulus Due to Elevated Temperature

SLRA section 3.5.2.2.2.2, associated with SLRA table 3.5-1, item 3.5-1, 048, as modified by SLRA Supplement 1 (ML22097A202), addresses reduction of strength and modulus of elasticity due to elevated temperatures for concrete elements of Groups 1-5 structures exposed to air-indoor uncontrolled environments. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.5.2.2.2.2 and finds it acceptable because PSL's concrete temperatures are kept below the GALL-SLR Report recommended threshold limits of 150°F for general areas and 200°F for local areas, and review of OE has identified no issues related to elevated temperatures affecting concrete structures. Therefore, the concrete components are not exposed to the temperatures required for this aging effect to occur.

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

addresses loss of material (spalling, scaling) and cracking due to freeze-thaw for concrete elements in below-grade inaccessible areas of water-control structures (Group 6) exposed to air-outdoor or groundwater or soil environments. The applicant stated this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.5.2.2.2.3, item 1, and finds it acceptable because PSL is located in a negligible weathering region (subtropical climate), as shown in ASTM C33-90, figure 1. Therefore, the concrete elements in below-grade inaccessible areas of Group 6 structures are not exposed to freeze-thaw weathering conditions required for this aging effect to occur; thus, a plant-specific program is not required to manage this aging effect.

Item 2. SLRA section 3.5.2.2.2.3, item 2, associated with SLRA table 3.5-1, item 3.5-1, 050, addresses cracking due to expansion from reactions with aggregates in inaccessible concrete areas of water-control structures (Group 6) exposed to any environment, which will be managed by the structures monitoring program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.5.2.2.2.3, item 2.

During the review, the staff noted that the structures monitoring program has been refined, based on industry and fleet information, to include visual examinations for patterned cracking, darkened crack edges, water ingress, and misalignment that would indicate reactions with aggregates, such as ASR and ACR, and includes opportunistic inspection of inaccessible concrete locations. The staff noted that plant OE has not identified any indications of ASR for the concrete structures at the plant site. The staff further noted that evaluations of accessible areas in the structures monitoring program provide the basis for extrapolation to the expected conditions of inaccessible areas and assessment of potential degradation in such areas.

The staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the structures monitoring program, as modified by SLRA Supplement 1 (ML22097A202) and the response to RAI 3.5.2.2.2.1-2 (ML22192A078), is acceptable because (1) plant OE has not identified any indications of ASR for the concrete structures at the site; therefore, a plant-specific AMP is not needed; (2) the refined inspections for ASR performed every 5 years under the structures monitoring program are able to identify conditions that could indicate ASR in accessible areas; and (3) the structures monitoring program provides evaluation of conditions in inaccessible areas if ASR is indicated in accessible areas.

Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR section 3.5.2.2.2.3, item 2 criteria. For those AMR items associated with SLRA section 3.5.2.2.2.3, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA section 3.5.2.2.2.3, item 3, associated with SLRA table 3.5-1, item 3.5-1, 051, addresses increases in porosity and permeability, loss of strength due to leaching of calcium hydroxide, and carbonation for concrete elements in inaccessible areas of Group 6 structures exposed to water-flowing environments, which will be managed by the structures monitoring program. The applicant stated that a plant-specific AMP or plant-specific enhancements to the structures monitoring program is not required to manage this aging effect in inaccessible areas. The staff reviewed the applicant's proposal against the criteria in SRP-SLR section 3.5.2.2.2.3, item 3.

During the review, the staff noted that the structures monitoring program inspects for evidence of leaching of calcium hydroxide and carbonation in accessible concrete and inaccessible below-grade concrete when excavated for any reason. The staff also noted that the structures monitoring program includes the site-specific enhancement to conduct a baseline inspection of inaccessible concrete by excavation, visual inspection, and physical inspection of the inaccessible concrete through pH analysis and a chloride concentration test at a location close to the coastline or intake and a location in the main plant area for comparison to detect whether increases in porosity and permeability, loss of strength due to leaching of calcium hydroxide, or carbonation is occurring in a water-flowing environment. The staff further noted that the structures monitoring program requires evaluation of inspection results for the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation of inaccessible areas. In addition, the staff noted that although plant OE has identified evidence of leaching in accessible areas, PSL's evaluation determined that the observed leaching did not adversely impact structural integrity or result in a loss of intended functions of the associated concrete structures.

In the review of components associated with item 3.5-1, 051, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal, as modified by SLRA Supplement 1 (ML22097A202), to manage the effects of aging using the structures monitoring program is acceptable because (1) the applicant's evaluation determined that the observed leaching of calcium hydroxide and carbonation in accessible areas has no impact on the intended function, and, therefore, a plant-specific AMP or plant-specific enhancements to the structures monitoring program are not needed for inaccessible areas; (2) the structures monitoring program inspects for evidence of the aging effect in accessible areas and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation to inaccessible areas; (3) the structures monitoring program will perform opportunistic inspections of inaccessible below-grade concrete when excavated for any reason; and (4) the structures monitoring program will include excavation, visual inspection, and physical inspection of the inaccessible concrete through pH analysis and a chloride concentration test at a location close to the coastline or intake and a location in the main plant area for comparison.

Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR section 3.5.2.2.2.3, item 3 criteria. For those items associated with SLRA section 3.5.2.2.2.3, item 3, the staff concludes consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will that the SLRA is adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.4 Cracking Due to Stress Corrosion Cracking, and Loss of Material Due to Pitting and Crevice Corrosion

SLRA section 3.5.2.2.2.4, associated with SLRA table 3.5-1, AMR items 3.5-1, 052; 3.5-1, 099; and 3.5-1,100, addresses cracking due to SCC and loss of material due to pitting and crevice corrosion for SS tank liners exposed to standing water and aluminum and SS support members, welds, bolted connections, and support anchorage to building structures exposed to air or condensation, which will be managed by the structures monitoring program; the ASME section XI, subsection IWF program; or the fire protection program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.4.

For SLRA AMR item 3.5-1, 052, the applicant stated that the corresponding item of SS tank liners in the GALL-SLR Report is not applicable. The applicant also stated that tanks at PSL are addressed with the mechanical system to which they belong, and the external surfaces monitoring of mechanical components AMP is credited with managing the condition of SS components in locations where water could collect (stand). The staff evaluated the applicant's claim against the criteria in SRP-SLR section 3.5.2.2.2.4 and finds it acceptable because a search of the applicant's SLRA and UFSAR confirmed that there are no SS tank liners exposed to standing water in the scope of subsequent license renewal.

The applicant stated that for SLRA table 3.5-1, AMR item 3.5-1, 099, as modified by Supplement 1 (ML22097A202), the applicability is limited to SS support components exposed to air because there are no aluminum ASME Class 1, 2, or 3 support components at PSL. The applicant also stated that SS ASME Class 1, 2, or 3 support components are managed for loss of material and cracking by the ASME section XI, subsection IWF AMP, supplemented by the structures monitoring AMP. The staff noted that a search of the applicant's SLRA and UFSAR confirmed that no in-scope aluminum support components, welds, bolted connections, or anchorages to structures are present in the ASME Class 1, 2, 3 or Class MC piping support systems. In the review of SS components associated with AMR item 3.5-1, 099, as modified by Supplement 1 for which the applicant cited generic note B, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME section XI, subsection IWF program for the applicable ASME code SS structural components is acceptable for the following reasons: (a) there is no site OE of cracking or localized corrosion of SS components at PSL; (b) when implemented, program enhancements (SLRA Tables 19-3 Commitments 33(k) and 36(l)) will update the applicant's IWF program to include actions to adequately manage aging effects of cracking due to SCC and pitting and crevice corrosion of its limited SS support components if determined to be necessary based on evaluation of related future OE results of similar support component-material-environment combinations under the structures monitoring program; and (c) the use of periodic visual inspections, supplemented by the structures monitoring program, to detect cracking and loss of material in SS structural support components will allow for degradations to be detected and corrective action to be taken prior to a loss of intended function.

SLRA table 3.5-1 AMR item 3.5-1, 100, as modified by Supplement 1 and the response to RAI 3.5.2.2.2.4-1 (ML22097A202 and ML22192A078, respectively), addresses cracking due to SCC and loss of material due to pitting and crevice corrosion for the portion of the aluminum and SS supports of non-ASME code piping and components exposed to air. For the SLRA table 2 AMR items associated with AMR item 3.5-1, 100 that cite generic note E, the SLRA credits the fire protection program to manage loss of material and cracking for the aluminum and SS fire barrier penetrations and radiant energy shields. Based on the review of components associated with AMR item 3.5-1, 100, as modified by Supplement 1 (ML22097A202) and the response to RAI 3.5.2.2.2.4-1 (ML22192A078) for which the applicant cited generic note E, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging for the aluminum and SS fire-rated assemblies using the fire protection program is acceptable for the following reasons: (a) there is no site OE of cracking or localized corrosion of aluminum or SS components at PSL, and (b) the use of periodic visual inspections in conjunction with the structures monitoring program, as described in the PSL fire protection AMP basis document, at a frequency of at least once every five years for the components of fire barrier assemblies under the fire protection program is consistent with the AMPs recommended by the GALL-SLR Report to ensure that the aging effects of cracking and loss of material can be detected and corrective action be taken prior to a loss of intended function.

In the review of components associated with AMR item 3.5-1, 100, as modified by Supplement 1 for which the applicant cited generic note B or D, the staff noted that the SLRA credits the structures monitoring program to manage the aging effects for aluminum and SS component supports, anchorage embedment, electrical and instrument panel and enclosures, conduits, and cable trays exposed to air. The staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the structures monitoring program for the applicable non-ASME code aluminum and SS structural components is acceptable for the following reasons: (a) there is no site OE of cracking or localized corrosion of aluminum or SS components at PSL, and (b) the use of periodic visual inspections to detect cracking and loss of material in aluminum and SS structural support components will allow for degradations to be detected and corrective action to be taken prior to a loss of intended function.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-SLR section 3.5.2.2.2.4 criteria. For those AMR items associated with SLRA section 3.5.2.2.2.4, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.5 Cumulative Fatigue Damage

SLRA section 3.5.2.2.2.5, associated with SLRA table 3.5-1, Item 053, states that there is no CLB fatigue analysis for cumulative fatigue damage due to time-dependent fatigue, cyclic loading, or cyclical displacement of component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 supports at the St. Lucie plant. The applicant also indicated that the cumulative fatigue damage due to cyclic loading is an applicable aging effect for cranes (overhead heavy and light load handling systems) at the St. Lucie plant, as separately addressed in Section 4.6.

In order to check whether a CLB fatigue analysis exists for Groups B1.1, B1.2, and B1.3 supports, the staff reviewed the following chapters of the St. Lucie UFSAR: (1) Chapter 3, "Design Criteria – Structures, Components, Equipment and Systems"; (2) Chapter 4, "Reactor"; (3) Chapter 5, "Reactor Coolant System"; (4) Chapter 6, "Engineered Safeguards"; (5) Chapter 9, "Auxiliary Systems"; and (6) Chapter 10, "Steam and Power Conversion System." In the review, the staff did not identify a CLB fatigue analysis for Groups B1.1, B1.2, or B1.3 supports. Therefore, the staff finds the applicant's evaluation on the cumulative fatigue damage for component supports acceptable because there is no CLB fatigue analysis involving a time-dependent assumption for Groups B1.1, B1.2, or B1.3 supports.

3.5.2.2.2.6 Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation

SLRA Revision 1, dated October 12, 2021 (ML21285A110), section 3.5.2.2.2.6 associated with SLRA table 3.5-1, AMR item 3.5-1, 097, addresses the applicant's further evaluation related to reduction of strength and mechanical properties of the reactor cavity concrete exposed to irradiation (neutron and gamma radiation and radiation-induced heating) in air-indoor uncontrolled environments. Section 3.5.2.2.2.6 was amended by Supplement 2 (ML22103A014), dated April 13, 2022, and supplemented by the applicant's responses to staff RAIs dated July 11, 2022 (ML22192A078). This section is also associated with SLRA sections 2.1.4.2.1, 2.3.3.12, 3.5.2.2.2.7, 4.2.1, B.2.2.2, B.2.3.4, B.2.3.30, and B.2.3.33. The staff reviewed the applicant's further evaluation against the criteria in SRP-SLR section 3.5.2.2.2.6.

The applicant evaluated the effects of irradiation on the reactor cavity concrete made up of the primary shield wall (PSW) and lower cavity concretes (LCC) to the end of the subsequent period of extended operation. SLRA table 2.4-1, "Containment Building Structure Components Subject to Aging Management Review," identifies the PSW subsequent renewal function to be that of radiation shielding, shelter and protection, and structural support. The LCC is physically and structurally connected to the PSW and because it is the supporting part of the PSW towards the reactor vessel (RV) air cavity, it shares PSW's design basis functions for shielding and protection.

The applicant determined in its further evaluation associated with SLRA table 3.5-1, AMR item 3.5-1, 097, that a plant-specific AMP or enhancement(s) to existing AMPs are not required as the PSW and LCC will continue to satisfy "the design criteria considering the long-term radiation effects" projected to the end of the subsequent period of extended operation, considered to be 72 effective full power years (EFPY). For its determination, the applicant used several Westinghouse, EPRI, and Pacific Northwest National Laboratory (PNNL) reports; the St. Lucie Unit 1 and St. Lucie Unit 2 UFSARs; and staff-audited plant-specific studies (ML22188A086).

More specifically, to determine the:

(a) exposure levels for fluence and gamma dose on the concrete PSW and LCC bioshields, the applicant used calculations summarized in Westinghouse Letter Reports, "LTR-REA-21-1-NP, Revision 1, St. Lucie Units 1 & 2, Subsequent License Renewal: Unit 1 Reactor Vessel, Vessel Support, and Bioshield Concrete Exposure Data," dated May 26, 2021 (SLRA Enclosure 4, Attachment 1 cited as SLRA Reference 3.5.4.1), and "LTR-REA-21-2-NP, Revision 1, St. Lucie Units 1 & 2 Subsequent License Renewal: Unit 2 Reactor Vessel, Vessel Support, and Bioshield Concrete Exposure Data," dated June 7, 2021 (SLRA Enclosure 4, Attachment 2 cited as SLRA Reference 3.5.4.2).

(b) effects of exposure for fluence and gamma dose including gamma heating at PSW and LCC surfaces and within, the applicant used methodologies described in EPRI Report No. 3002002676, "Expected Condition of Reactor Cavity Concrete After 80-Years of Radiation Exposure," dated March 2014 (SLRA Reference 3.5.4.4), and No. 3002011710, "Irradiation Damage of the Concrete Biological Shield Wall for Aging Management," dated May 2018 (SLRA Reference 3.5.4.6), as well as concrete composition datasets in PNNL Report 15870, Revision 1, "Compendium of Material Composition Date for Radiation Transport Modelling," dated April 2006 (SLRA Reference 3.5.4.5).

(c) structural integrity of PSW and LCC to the end of the subsequent period of extended operation, the applicant used, in addition to the aforementioned, the analysis of record (AOR) and the North Anna Syndrome (asymmetric loss-of-coolant accident [LOCA] loads) study discussed in the SLRA, Supplement 2, and in UFSAR Unit 1 appendix 3H to conclude in its basis document NEESL 00008-REPT-098, "St. Lucie Units 1 and 2 Subsequent License Renewal Primary Shield Wall Irradiation Evaluation" (ML22188A086), and to state in its SLRA that evaluation of table 3.5-1, AMR item 3.5-1, 097 determined that a plant-specific AMP or enhancement(s) to existing AMPs are not required to manage the effects of aging for PSW concrete and LCC.

The staff evaluated SLRA section 3.5.2.2.2.6 to ensure that the applicant is providing reasonable assurance that "the effects of aging will be adequately managed so that the [PSW/LCC shielding, shelter, protection, and structural support] intended function(s) will be maintained consistent with the CLB throughout the […] SPEO." Accordingly, the staff's review addresses the PSW and LCC capacities to withstand all design basis loads and loading combinations in an air-indoor environment for loss of concrete strength and reduction of its mechanical properties due to effects of irradiation, including gamma heating.

PSW/LCC Irradiation Exposure Assessment

During the regulatory audit (ML22188A086), the staff verified that the Westinghouse calculations provided in LTR-REA-21-1-NP, Revision 1 (ML21285A112), and LTR-REA-21-2-NP, Revision 1 (ML21285A112) used PSL-specific analytical models; the NRC-approved fluence analysis methodology documented in WCAP-18124-NP-A, Revision 0, "Fluence Determination with RAPTOR-M3G and FERRET," dated July 2018, (ML18204A010); and the guidance presented in RG 1.190, Revision 0, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence." The staff also confirmed that a 10 percent positive bias was applied on the peripheral and re-entrant corner assemblies of a conservative and bounding core design for future fuel cycle projections and that future cycle designs are within the bounding core designs used for PSL Units 1 and 2. These results of PSL-specific Westinghouse analyses documented in Westinghouse Letters LTR-REA-21-1-NP, Revision 1 (ML21285A112), and LTR-REA-21-2-NP, Revision 1 (ML21285A112) provide exposure data for energies greater than 0.1 MeV at the bioshield (PSW and LCC) concrete surface as a function of irradiation time, azimuthal angles, and location relative to the core cardinal axes.

The staff finds the applicant's use of WCAP 18124-NP-A, Revision 0 methodology, as approved by the NRC, and the aforementioned reported data and calculations acceptable for the following reasons: (a) the applicant based its neutron transport calculations on a PSL-specific geometric model that included details of surveillance capsules and associated support and subsequent comparisons of generated relevant data to actual in-vessel surveillance capsule threshold sensor measurements, consistent with limitations and conditions stated in WCAP 18124-NP-A, Revision 0; (b) the applicant demonstrated applicability of the 20 percent uncertainty criterion specified in RG 1.190 by comparing measurement-to-calculation (M/C) and best-estimate-to-calculation (BE/C) to their standard deviation, which on the average agree within the 13 percent (1σ) analytical uncertainty assigned in WCAP-18124-NP-A to fast neutron ($E > 1.0$ MeV) fluence values at RV beltline locations.

The staff notes that past calculations for neutron fluence and gamma dose for concrete have generally been found acceptable in prior reviews on the basis that the uncertainty in the calculations necessary for the results to exceed the damage thresholds in the SRP-SLR are substantial. However, in the present review, the reported neutron fluence for concrete already exceeds the damage thresholds. The staff could not conclude that sufficient conservatism exists for the calculated limiting neutron fluence at the PSW and LCC to accommodate uncertainties in the fluence analysis methodology associated with calculating exposure at an ex-vessel location. Therefore, the staff sought to determine whether the intended functions of the PSW and LCC would be maintained based on conservatism in the calculation. Accordingly, the staff issued RAI 3.5.2.2.2.6-1 for an estimate of the uncertainty on the neutron fluence and displacement per atom (dpa) results for the RV steel support structure assemblies (SSSAs) with the applicant's responses reviewed and dispositioned in SE section 3.5.2.2.2.7.

For the conservatism in net analytical uncertainty of 20 percent considered in SLRA Supplement 2 on the values of SLRA table 3.5.2.2.-2, the applicant stated that a plant-specific uncertainty analysis at the inner surface of the PSL PSW was not performed. The staff notes that the analytical uncertainty of 12 percent inherent to WCAP 18124-NP-A, Revision 0, RAPTOR 3 methodology for the reactor cavity at core midplane can be augmented to a net analytical uncertainty of 20 percent when considering the analytical uncertainties of RV extended beltline analysis discussed in SLRA Supplement 2 and further elaborated on in the applicant's response to RAI 3.5.2.2.2.6-1. Therefore, the staff finds the net analytical uncertainty of 20 percent to be acceptable because it was established based on: (a) NRC-approved methodology described in WCAP-18124-NP-A, Revision 0, Supplement 1-P/NP (ML22153A138 and ML22153A139 for proprietary and non-proprietary versions, respectively), dated May 2022, for analyses results obtained; (b) the geometry of the PSW and LCC are well represented in the plant-specific model used in the analyses, consistent with the level of analysis detailed in WCAP-18124-NP-A, Revision 0; (c) parameters with significant contributions to core neutron source, reactor geometry, coolant temperature, discretization, and modeling approximations were considered in the analyses; and (d) the root sum of squares methodology was used to determine individual parameter uncertainty values at each location.

With regard to maximum neutron fluence and gamma dose projections at the inner surface of the PSW that occur at elevations near the fuel core midplane, the staff noted that the applicant used a bounding estimate representative of fast neutrons (E > 1.0 MeV) within a foot of the top and bottom of the active fuel. The estimated 20 percent uncertainty does not explicitly account for neutrons with energies between 1.0 MeV and 0.1 MeV; however, it is acceptable for all energy levels greater than 0.1 MeV because the maximum exposures at the PSW and LCC occur at elevations near the core midplane, where the analytical uncertainty for fast neutrons (E > 1.0 MeV) is approximately 12 percent, as noted in WCAP 18124-NP-A, Revision 0. While the uncertainty associated with fast neutron (E > 0.1 MeV) fluence at the PSW inner surface and elevations may be greater than that, it is not expected to be significantly different or greater than the estimated uncertainty of 20 percent noted in the PSL SLRA Supplement 2.

Therefore, the staff finds that the neutron fluence uncertainty estimates of 20 percent from the extended beltline analysis represent the neutron fluence uncertainties for the PSW and LCC structural components at the associated axial locations.

PSW/LCC Structural Integrity Assessment

During the regulatory audit, the staff verified that figure 3.5.2.2-1 of the SLRA represents the general configuration of the RV air cavity. Specifically, the staff verified that the RV air cavity has two rings. The upper ring forms the PSW, a 7.25-feet-thick concrete ring rising 18 feet above the 10.5-feet-high, 33-feet-thick LCC ring that rests on the concrete basemat (see also figure 3H-13 of PSL Unit 1 UFSAR, [ML20141L649]). The RV supporting beams (reviewed and evaluated in SE section 3.5.2.2.2.7) frame into the PSW at about 5 feet above the LCC. Beyond the terminal point of the unlined PSW concrete, the cavity walls become part of the refueling canal that terminates at the operating deck.

In the evaluation of the PSW and LCC structural integrity, the staff considered their proximity to the RV and aging effects resulting from streaming fluence, radiation-induced volumetric expansion (RIVE), thermal effects due to gamma exposure, and heating that could contribute to concrete loss of strength and reduction of its mechanical properties.

With regard to the maximum calculated exposure of the PSW and LCC at energy levels of E > 0.1 MeV, summarized in SLRA table 3.5.2.2-2, the staff noted that, at the end of the subsequent period of extended operation, the fluence is projected to exceed the SRP-SLR limit of 1.0E19 n/cm^2, while the gamma dose radiation remains below the SRP-SLR limit of 1.0E10 rads. Accordingly, the staff reviewed potential PSW and LCC projected loss of strength and volumetric expansion. Based on the review of the calculated fluence on the PSW and LCC from Westinghouse Reports LTR-REA-21-1-NP, LTR-REA-21-2-NP (ML21285A112) noted in the aforementioned table; calculations provided in staff-audited NEESL 00008-REPT-098 implementing EPRI Report No. 3002011710 methodology, which has not been submitted to the staff for full review or endorsement; SLRA as amended by Supplement 2; and the applicant's responses to RAI 3.5.2.2.2.6-1 (ML22192A078), reviewed and evaluated in SE section 3.5.2.2.2.7, the staff finds that the effects of fluence on the structural integrity of the RV air cavity concrete (PSW and LCC) to be minimal, and therefore, acceptable.

The staff further notes that attenuation of flux or fluence in the PSW and LCC deduced from neutron and gamma transport codes used in the development of the aforementioned EPRI methodology, summarized in part in Bruck et al., demonstrates that PSL Unit 2 fluence, even when conservatively increased by a net analytical uncertainty of 20 percent, as discussed in the applicant's response to RAI 3.5.2.2.2.6-1 (ML22192A078), would not imperil bonding of the rebars to concrete and their fracture toughness, as the depth of fluence effects on concrete are limited to just over 1 inch at or near fuel mid-plane concrete elevation, where radiation streaming is at its maximum.

In areas of concrete proximal to the reactor core midplane where fluence with energy levels of E > 0.1 MeV exceeds the SRP-SLR limit of 1.0E19 n/cm^2, the staff notes that concrete coarse aggregates mineralogy could further distress the irradiated damaged concrete volume. This phenomenon, identified as RIVE (see Rosseel et al., 2016, and LePape et al., 2018 and 2020), could further increase concrete damage, loss of strength, and reduction of its mechanical properties. In regard to PSL aggregates, the staff notes that there is no specific information on concrete aggregates to assess their potential to swell. SLRA 3.5.2.2-1, as amended by Supplement 2, does not identify the origin and mineral composition of fine and coarse aggregates used as constituents in concrete in the PSW and LCC mix, other than that they were manufactured aggregates. Assuming an increase to PSL Unit 2 fluence by as much as 20 percent due to the aforementioned net uncertainty, RIVE, according to Field et al., 2015, could swell the volume of the damaged concrete by 14 to 18 percent, thus inducing additional tensile or compressive stresses and extending the depth of affected (stressed) concrete. However, this would still be less than the minimum concrete clear cover (distance between the outer surface of concrete to the nearest surface of reinforcing bar), which could be as little as 2 inches but typically ranges between 3 and 4 inches. Therefore, potential damage to the RV air cavity concrete at these locations would be a little over an inch deep at most and would manifest as non-structural superficial cracks or minimal spalls. To date, the structures monitoring AMP (reviewed and evaluated in SE section 3.0.3.2.26) has not identified any noticeable degradation in the areas of concern.

With regard to effects of radiation on the tensile failure of the PSW and LCC vertical reinforcing steel bars discussed in the SLRA and its Supplement 2, the staff finds acceptable the applicant's evaluation that the interaction ratio (applied stress to allowable stress) will not exceed that calculated by the AOR. The staff based its conclusion on the following: (a) the reinforcing steel for both Units would remain unaffected to streaming radiation. Even when a net uncertainty of 20 percent is applied to the maximum exposures at the end of the subsequent period of extended operation, fluence would still be below the 1.0E20 n/cm^2 expected to cause a rise in the ductile-brittle transition temperature and reduced ductility in the mechanical properties of carbon-steel reinforcing bars, as discussed in ACI 349.3R-18; (b) the maximum applied stress of 27.6 ksi due to the (faulted) loading condition that includes thermal, dead, seismic, LOCA, and North Anna Syndrome (asymmetric blowdown) loads, as noted in the AOR, is significantly reduced because the "dynamic effects of guillotine and slot breaks in the [primary reactor coolant system] RCS hot and cold leg piping have been eliminated due to [implementation of] leak-before-break (LBB) technology" (ML16113A329), further elaborated on in section 3.6 of PSL Unit 1 and 2 UFSARs; (c) the PSL Unit 2 interaction ratio is less than that reported in the SLRA because although Unit 2 is built with the same strength concrete as Unit 1, it is reinforced with Grade 60 steel bars as opposed to Grade 40 of Unit 1; (d) for the effects of extended power uprate (EPU) conditions on the P-T response of the reactor cavity with those arising from radiation, the staff notes that implementation of LBB methodology has led to reduced concrete interaction ratios because large LOCA effects are no longer to be considered in the governing faulted loading conditions (ML12181A019, ML12156A208, and ML12268A167).

With regard to PSW cracking at the girder embedment as stated in SLRA Supplement 2 and referring to Unit 1 UFSAR, appendix 3H, section F, figures 3H-34 to 3H-42, the staff finds the applicant's supplemental information that the AOR will remain unaffected by the streaming radiation discussed above acceptable because (a) the location of girders framing into the PSW is away from the reactor core midplane, as noted by the applicant; and (b) implementation of LBB will significantly reduce the LOCA associated loads for the analysis of the reactor cavity concrete described in the UFSAR with details of the applicable loading condition shown in a letter by R. E. Uhrig of FPL dated August 30, 1977, to D. K. Davis of the NRC (ML18108A562).

With regard to gamma radiation, there are two aspects that need to be addressed. The first deals with damage to concrete due to gamma dose, essentially identified as gamma damage, while the second deals with gamma heating that augments service heating. Gamma dose can increase in concrete due to gamma production by neutron capture. Gamma heating, on the other hand, could alter service condition temperatures within the concrete. For PSL, gamma damage to the RV air cavity concrete is not an issue because the calculated dose summarized in SLRA table 3.5.2.2-2, even augmented by a net uncertainty of 20 percent, remains below the SRP-SLR limit of 1.0E10 rads. In regard to the RV air cavity temperature, as stated in SLRA section 2.3.3.12, "Ventilation," and verified by the staff in UFSAR sections 9.4.8.1 and 9.4.8.6 for Unit 1 and Unit 2, respectively, each Unit's reactor cavity cooling system (RCCS) provides adequate airflow to maintain cavity concrete temperature at or below 150°F so that potential concrete dehydration and consequent concrete damage are minimized. Although the RV air cavity temperature is maintained at 150°F, the staff also noted that UFSAR Unit 1, appendix 3H, section B states that to restrict thermal growth of RV support girders at the concrete interface during reactor operation, PSL maintains a local temperature of 120°F. Hence, the staff concludes that effects of gamma radiation on PSW and LCC warrant no further examination because of: (a) the absence of significant gamma radiation, and (b) low concrete service temperatures in the RV air cavity, particularly in areas of girder supports framing into the concrete. The staff therefore concludes, for the aforementioned reasons, that gamma radiation has no effect on reduction strength and mechanical properties on the RV air cavity concrete to the end of the subsequent period of extended operation.

With regard to management of the effects of aging at PSW and LCC, the staff notes that the applicant properly identified that a plant-specific AMP or enhancements to one or more of the applicant's existing AMPs are not required for managing the effects for "Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation." The staff notes that the structures monitoring AMP, which has a 5-year frequency of inspections, manages these aging effects. The staff further notes that Supplement 2 of the SLRA states that within that time frame, the applicant monitors the condition of the accessible concrete surfaces through digital photography collected during each outage through the BAC AMP (reviewed and evaluated in SE section 3.0.3.2.5) inspections. The additional information collected includes input into the 5-year structures monitoring AMP evaluation report. The ASME section XI Inservice Inspection, subsection IWF AMP performs additional assessments (reviewed and evaluated in SE section 3.0.3.2.24) during the IWF-mandated inspections. The aforementioned three AMPs provide a comprehensive record of the condition of the RV air cavity area, including the interfaces between the RV supports and the concrete, during the subsequent period of extended operation. The staff finds this inspection approach conservative and comprehensive and therefore acceptable.

Overall Conclusion

In summary, based on the review of SLRA sections 3.5.2.2.2.6 and 3.5.2.2.2.7, as amended by its Supplement 2, its enclosures, and the applicant's responses to the staff's concerns addressed in RAI 3.5.2.2.2.6-1, the staff finds that the applicant:

(a) met the intent of the SRP-SLR further evaluation criteria consistent with the GALL-SLR Report principles regarding the structural integrity of concrete for the PSW and LCC for PSL Units 1 and 2 to the end of the subsequent period of extended operation;

(b) met the SRP-SLR acceptance limits for estimated gamma dose values at the PSW and LCC concrete on calculations of a conservatively applied NRC-approved methodology to the end of the subsequent period of extended operation;

(c) did not meet the SRP-SLR acceptance limits for estimated fluence values at areas of interest in the RV air cavity concretes, but the PSW and LCC will continue to fulfil its intended function without any potential reduction in strength and mechanical properties due to effects of fluence to the end of the subsequent period of extended operation;

(d) to date, has not provided any plant-specific OE that shows a reduction of strength and mechanical properties of concrete due to irradiation aging effects;

(e) has in place provisions to manage the effects of aging of loss of material, deterioration, distress, cracking, and loss of rebar bond for the RV air cavity concrete with the structures monitoring AMP, aided by the BAC and ASME section XI, subsection IWF AMPs to the end of the subsequent period of extended operation;

(f) has in place a commitment for each Unit (SLR Commitment 49, appendix A1 and appendix A2, table 19-3, for Units 1 and 2, respectively) to follow the ongoing industry efforts for effects of irradiation on concrete and corresponding aging management recommendations, including reevaluations so that an informed site-specific program be developed, if needed

(g) has adequately addressed the staff's concerns related to all potential aging effects consistent with SRP-SLR and GALL-SLR Report principles regarding deterioration of PSW and LCC concretes.

Therefore, based on the above, the staff finds that the applicant's determination that a plant-specific program or enhancement(s) to existing AMPs are not required to manage aging effects of irradiation for the RV air cavity concretes (that of PSW and LCC) is acceptable. For those AMR items associated with SLRA section 3.5.2.2.2.6, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.7 Expected Further Evaluation for Loss of Fracture Toughness due to Irradiation Embrittlement of Reactor Pressure Vessel (RPV) Supports from NRC Review of the Previous SLRAs

SLRA Revision 1, dated October 12, 2021, section 3.5.2.2.2.7, associated with SLRA table 3.5-1, AMR item 3.5-1, 097, addresses further evaluation related to reduction of fracture toughness due to neutron irradiation embrittlement of the RV SSSAs. The applicant noted that this further evaluation is based on review of the staff's review of past SLRAs. The RV SSSAs include three long steel columns anchored by stiffened base plates to the concrete floor. Each column is bolted to a horizontal fabricated support stiffened with plates and includes a socket and slide assembly to support one of the RPV nozzles. The socket and slide assembly is made of lubricated manganese bronze plates. SLRA section 3.5.2.2.2.7 was amended by Supplement 2 (ML22103A014), dated April 13, 2022, and supplemented by responses to RAIs dated July 11, 2022 (ML22192A078). This section is also associated with SLRA sections 2.3.1.1, 2.4.1, 3.5.2.2.2.6, and B.2.2.2, B.2.3.4, B.2.3.30, and B.2.3.33.

The amended SLRA section describes the RV SSSAs of PSL Units 1 and 2 and states that the two units have essentially identical RV SSSAs. Based on the evaluation, the applicant determined that table 3.5-1, AMR item 3.5-1, 097 is not applicable and that a plant-specific AMP or enhancement(s) to existing AMPs are not required to manage the effects of neutron irradiation on the RV SSSAs. For this determination, the applicant used Westinghouse Letter Report, "LTR-REA-21-1-NP, Revision 1, St. Lucie Units 1 & 2, Subsequent License Renewal: Unit 1 Reactor Vessel, Vessel Support, and Bioshield Concrete Exposure Data," dated May 26, 2021 (SLRA Enclosure 4, Attachment 1 cited as SLRA Reference 3.5.4.1); LTR-REA-21-2-NP, Revision 1, "St. Lucie Units 1 & 2 Subsequent License Renewal: Unit 2 Reactor Vessel, Vessel Support, and Bioshield Concrete Exposure Data," dated June 7, 2021 (SLRA Enclosure 4, Attachment 2 cited as SLRA Reference 3.5.4.2); St. Lucie Units 1 and 2 UFSARs; and staff-audited plant-specific studies (ML22188A086). The applicant summarized the radiation exposure information relevant to PSL Units 1 and 2 RV SSSAs in several SLRA tables (e.g., for surveillance capsules M/C and BE/C Supplement 2 in tables 2-1 through 2-4, for fluence in table 3.5.2.2-2, for dpa in tables 3.5.2.2-3 and 3.5.2.2-4, and for postulated flaws via comparative ratios in table 3.5.2.2-5) for the subsequent period of extended operation.

Specifically, the applicant addressed the further evaluation for reduction of fracture toughness due to irradiation embrittlement of the PSL RV SSSAs through a qualitative assessment relative to the results of the critical flaw sizes determined in the Point Beach Nuclear (PBN) SLRA (ML20329A247). This assessment is documented in Westinghouse Report, LTR-SDA-21-021-NP, Revision 2 (SLRA Enclosure 4, Attachment 3, [ML21285A112]) and is based on a comparative ratio of critical flaw sizes at PSL relative to those evaluated for PBN.

The applicant summarized key comparative ratios used in this assessment for limiting components of PSL RV SSSAs units in SLRA table 3.5.2.2-5, as amended by SLRA Supplement 2. The applicant explained that the comparative ratios in table 3.5.2.2-5 represent normalized fracture toughness and stress at PSL relative to those reported in the PBN SLRA as they pertain to the determination of critical flaw sizes. The applicant further explained that a comparative ratio of greater than 1 indicates that the PSL critical flaw size would be larger than that of PBN, and therefore the conclusions reached in the fracture mechanics evaluation in Supplement 1 of the PBN SLRA (ML21111A155) can be applied to PSL as well. To validate this qualitative assessment presented in LTR-SDA-21-021-NP/P, Revision 2 (SLRA Enclosure 4, Attachment 3, and Enclosure 5, Attachment 1, for the non-proprietary and proprietary versions, respectively), and summarized in the PSL SLRA, the applicant performed a PSL-specific fracture mechanics evaluation for the RPV SSSAs in WCAP-18623-NP/P, Revision 1 (ML22103A133 for the non-proprietary version and ML22103A134 for the proprietary version). The staff's evaluation of the PBN critical flaw sizes is found in section 3.5.2.2.2.7 of the PBN SE, Revision 1, dated May 2022 (ML22140A127).

Key inputs to these comparative ratios are fracture toughness and stress at limiting components. Staff evaluated these key inputs in the "*Fracture Toughness of the RV SSSAs*" and "*PSL vs PBN RV SSSA Stress Conditions*" sections below. To assess these key inputs, the staff reviewed the neutron (and gamma dose) exposure in the RV SSSAs in the "*Neutron Fluence at RV SSSAs*" section below, as radiation exposure plays a key role in the determination of fracture toughness. Also, the staff reviewed RV SSSA load capacities in the "*Structural Integrity of the RV SSSAs*" section below.

Because the applicant's comparative ratio approach is relative to the PBN evaluation, in the "*Assumptions and Conservatisms in RV SSSA Evaluations*" section below, the staff evaluated the consistency of the assumptions and conservatisms in the applicant's evaluation of the PSL RPV SSSAs with those in the PBN evaluation.

Neutron Fluence at RV SSSAs

The staff reviewed SLRA section 3.5.2.2.2.7, as modified by response to RAI 3.5.2.2.2.6-1 (ML22160A367 and ML22192A078), and finds it is acceptable for the following reasons:

(a) The geometry of the RV support columns is well represented. When considering the reasonable level of detail in the extended plant-specific model for the beltline region, which helps minimize the increase in uncertainty in the core midplane, the uncertainty estimate from the extended beltline region analysis is expected to be comparable, if not bounding. According to WCAP-18124-NP-A, the RAPTOR-M3G methodology has an estimated analytical uncertainty of 12 percent for neutron fluence for the reactor cavity at the mid-core location. The applicant's extended beltline analysis estimated an analytical uncertainty of 20 percent for neutron fluence approximately 12 inches above the top of active fuel. This increase in analytical uncertainty is consistent with the discussion above. Therefore, the staff finds that 20 percent is a representative estimate for the neutron fluence uncertainty for the RV support columns; the analytical uncertainty for the top of the 6-inch plate under the RPV nozzle foot was 25 percent, which is also reasonable.

(b) Regarding the ring girder lower edge and upper edge, the axial locations of these RV SSSAs exist outside the beltline region. Additionally, the closest approach of these structures to the RV is just above the outer surface; the radial distance from the RV outer surface to the ring girder is negligible. Therefore, the staff finds that the neutron fluence uncertainty estimates from the extended beltline analysis represent the neutron fluence uncertainties for these structural components at the associated axial locations.

Structural Integrity of the RV SSSAs

The staff reviewed SLRA section 3.5.2.2.2.7 and its Supplement 2 to assess the validity of the applicant's claim that the RV "supports at PSL Units 1 and 2 are structurally stable (i.e., flaw tolerant) considering 80 calendar years (72 EFPY) of radiation embrittlement effects." The staff notes that structural stability includes not only aspects of crack stability in tensile members but also the integrity of other RV SSSA structural steel components. To this end, the staff examined the SLRA to determine whether critical RV SSSA components have been identified and demonstrated that effects of aging would be adequately managed so that the intended function(s) will be maintained consistent with the CLB in accordance with 10 CFR 54.21(a)(3) during the subsequent period of extended operation.

The staff verified that that the structural integrity of PSL Unit 1 and Unit 2 RV SSSAs remained, as the staff previously concluded following review of the EPUs (ML12156A208 and ML12268A167, for Units 1 and 2 respectively). The elimination of large-break LOCAs discussed in the EPUs resulted in increased margins for the faulted loading condition at each support during the subsequent period of extended operation. Therefore, with regard to interaction (loading) ratios associated with the UFSAR-identified loads and loading conditions and discussed conservatisms above, the staff finds that the interaction ratios remain less than one, consistent with the CLB, and are therefore, acceptable.

With regard to RV SSSA support shoe assembly, the staff notes its unique structure and configuration made with ferrous and nonferrous materials. During the regulatory audit, the staff reviewed the effects of fluence, gamma dose, and thermal effects on the concave ASTM A283 steel plates and on convex ASTM B-22 Alloy E manganese bronze-alloy slide and expansion plates infused with graphite-based Lubrite® lubricant and requested that the applicant, through RAI 3.5.2.2.2.6-2 (ML22160A367), further discuss the potential for radiation embrittlement and performance of the manganese bronze alloy infused with Lubrite®. The staff reviewed the applicant's response (ML22192A078) that an analysis for radiation embrittlement for manganese bronze alloy is unnecessary and finds it acceptable because (a) the material as used is primarily under compressive and friction loads, and (b) SCC is ruled out for these components because they are not exposed to combined conditions of an aqueous environment, high temperatures, and tensile stress. Hence, for this component material and environment, no crack growth mechanism is likely to occur, and therefore an evaluation for loss of its intended function is not needed. As for effects of gamma heating fluxes on the sliding shoe assembly, the staff finds the results of applicant's analysis showing that the temperature remains below the 300°F limit acceptable because they are based on specialized validated and verified finite element analysis (FEA) codes.

The staff previously reviewed the performance of Lubrite® under gamma dose in its earlier SE Report "Related to the Subsequent License Renewal of Surry Power Station, Units 1 and 2" (ML20052F523), which referenced the National Aeronautics and Space Administration (NASA) Report SP-8053, "Nuclear and Space Radiation Effects on Materials," dated June 1970. The NASA Report SP-8053 provides tests results showing that graphite properties do not experience significant aging effects until neutron fluence becomes greater than 1.0E19 n/cm^2 at energy levels of E > 1.0 keV, which includes effects of both fast and slow neutrons. As the applicant noted in SLRA Supplement 2, "[t]he PSL average neutron flux is approximately 9.3 x 10^7 n/cm^2-sec," or 2.34E17 n/cm^2 for 80 years of exposure, which is less than the identified fluence limit, and therefore the staff finds its performance is acceptable to the end of the subsequent period of extended operation. The staff also finds that the Lubrite® wear life and capacity as a lubricant for an average exposure intensity (flux) of 9.3E7 n/cm^2-s encountered at the PSL shoe location during the subsequent period of extended operation acceptable because it is less than the 3.0E12 n/cm^2-sec and 4.0 x 10E11 n/cm^2-sec fluxes, which were found to negatively affect the wear life and coefficient of friction, respectively, recognized in the report, NASA TN D-6940, "Dynamic Friction and Wear of a Solid Film Lubricant During Radiation Exposure in a Nuclear Reactor," dated September 1, 1972.

RV SSSA Aging Effects

The staff notes that the applicant correctly identified the necessity for physical examination of the supports prior to application of the NUREG-1509 methodology for fracture toughness evaluation of the supports. To this end, the staff noted that prior to reevaluating the RV SSSAs to radiation exposure–induced aging effects, the applicant determined, as reported in SLRA section 3.5.2.2.2.7, as amended by SLRA Supplement 2, their existing physical condition through VT-3 visual and magnetic particle examinations. The applicant determined that the current condition, including aging effects manifested as "rust, corrosion, cracks or permanent deformation," would not inhibit the intended support functions or require additional considerations in the fracture mechanics evaluation discussed in detail below. The staff's regulatory audit (ML22188A086) of the plant OE for the RV SSSAs confirmed that there was no damage or degradation to the RV SSSAs requiring further evaluation. The staff noted that applicable AMPs for surveillance, inspections, and examinations for the aforementioned aging effects include ongoing ASME section XI, subsection IWF, BAC, and structures monitoring AMPs, described in SLRA sections B.2.3.30, B.2.3.4, and B.2.3.33, respectively. These AMPs were reviewed and evaluated in corresponding SE sections 3.0.3.2.24, 3.0.3.2.5, and 3.0.3.2.26, respectively. These AMPs are designated for management of aging effects for RCS Class 1 structural supports and structural bolting by SLRA table 3.5.2-1 items referenced in addition to table 3.5-1, item 3.5-1, 097 addressing RV SSSA fixity conditions and table 3.5-1 items 087, 068, 089, and 091 addressing RV SSSAs loss of preload, cracking, and loss of material.

The staff finds the applicant's program regarding specific inspections of PSL RV SSSA Unit 1 and Unit 2 supports conservative, comprehensive, and therefore acceptable because: (a) the applicant performs the ASME section XI IWF required category F-A, item 1.40 examination and inspection to each PSL RV support during the required 10-year examination interval; (b) the applicant includes in these ASME section XI, subsection IWF examinations magnetic particle examination (MT) of the nozzle supports; (c) to date, there has been no OE deemed unacceptable or inconsistent with IWF-3410 requirements; and (d) the applicant includes increased surveillance and digital photography performed by the BAC AMP at every refueling outage, subject to as low as is reasonably achievable (ALARA). These additional inspections have substantially reduced the risk of potentially emerging unacceptable conditions that may put at risk the validity of the applicant's RV SSSA fracture toughness evaluation or the integrity of the anchorage of the RV supports to the air cavity concrete during the subsequent period of extended operation.

Fracture Toughness of the RV SSSAs

Following the verification of the adequacy of ASME section XI, subsection IWF inspections of the PSL RV SSSAs, the applicant implemented the NUREG-1509 methodology for determining fracture toughness (K_{IC}) values of the RV SSSA components in LTR-SDA-21-021-NP, Revision 2, Section 5.0 (ML21285A112), and WCAP-18623-NP/P, Revision 1, section 5.1 (ML22103A133 and ML22103A134, respectively). The staff compared the applicant's methodology for determining K_{IC} values with that used in the PBN evaluation in WCAP-18554-NP/P, Revision 1, Section 5.1 (ML20329A264 for the non-proprietary version and ML20329A287 for the proprietary version) and finds that the applicant's methodology is consistent with the PBN evaluation. Specifically, the staff compared the PSL and PBN methodologies for the determination of initial K_{IC} values, adjustment of the initial K_{IC} values for strain rate and temperature, and the use of the upper bound curve of figure 3-1 of NUREG-1509 to determine the amount of embrittlement. The amount of embrittlement in figure 3-1 of NUREG-1509 is the shift in nil-ductility transition temperature (ΔNDTT) shown as a function of radiation exposure expressed in dpa. The staff confirmed that the dpa values in SLRA tables 3.5.2.2-3 and 3.5.2.2-4, which show radiation exposure data resulting from the full neutron energy spectrum at the limiting locations of the PSL RPV SSSAs, are consistent with tables 4-18 of LTR-REA-21-1-NP, Revision 1 and LTR-REA-21-2-NP, Revision 1, included as Attachments 1 and 2 of Enclosure 4 to the SLRA (ML21215A314). The staff also confirmed that the K_{IC} values at the limiting locations of the PSL RV SSSAs in LTR-SDA-21-021-NP, Revision 2, table 5-1 accounted for embrittlement (i.e., ΔNDTT) that was based on the dpa values in SLRA tables 3.5.2.2-3 and 3.5.2.2-4. Based on the above discussion, the staff finds that the K_{IC} values at the limiting locations of the PSL RV SSSAs in LTR-SDA-21-021-NP, Revision 2, table 5-1 (ML21285A112) are acceptable.

In SLRA section 3.5.2.2.2.7, the applicant stated that for fracture toughness determination, available Charpy V-notch (CVN) data from certified material test reports (CMTR) were considered, and where CVN data was not available, guidance from NUREG-1509 was used. The applicant discussed the details of this approach for fracture toughness determination in WCAP-18623-NP/P, Revision 1. Based on the review of WCAP-18623-NP/P, Revision 1 (ML22103A133 and ML22103A134, respectively) on this topic and a comparison of the K_{IC} values at the limiting locations of the PSL RV SSSAs in LTR-SDA-21-021-NP, Revision 2, table 5-1 (ML21285A112), the staff finds that the fracture toughness values using the NUREG-1509 guidance are adequate compared with those determined from CVN data from CMTRs.

In SLRA table 3.5.2.2-5, as amended by SLRA Supplement 2 dated April 13, 2022 (ML22103A014), and further clarified by letter dated July 11, 2022 (ML22192A078) the applicant reported comparative ratios that accounted for an additional 25 percent dpa in the fracture mechanics evaluation in WCAP-18623-NP/P, Revision 1 (ML22103A133 and ML22103A134, respectively), to address the net analytical uncertainties associated with the methodology used to calculate embrittlement. The applicant also clarified that the estimated analytical uncertainty of +25 percent is associated with the methodology used to calculate the iron dpa values of the RPV SSSAs only and does not account for other parameters used in the embrittlement calculations. The staff noted that this additional 25 percent dpa directly impacts the calculation of K_{IC} values and adds conservatism in the calculated values because the dpa values are used to determine ΔNDTT via NUREG-1509, figure 3-1, and ΔNDTT is used to calculate the amount of reduction in K_{IC} values. The staff confirmed that the K_{IC} calculations described in WCAP-18623-NP/P, Revision 1, section 5.1, considered the additional 25 percent dpa values.

PSL vs PBN RV SSSA Stress Conditions

As noted in "*Structural Integrity of the RV SSSAs*," to determine stresses derived for the fracture mechanics evaluation, the applicant devised a "worst case" geometry support, with peak loads summed as absolute static loads irrespective of their application time, leading to overestimated stresses. The staff confirmed the determination of stresses at the limiting locations of the PSL RV SSSAs in LTR-SDA-21-021-NP, Revision 2, sections 6.1, 6.2, 7.1, and 7.2 (ML21285A112). Stresses were calculated for the worst-case geometry model and used the total cumulative load of the deadweight, thermal, safe shutdown earthquake (SSE), and LOCA loads, consistent with the definition of faulted condition in the UFSARs of the PSL units. With regard to LOCA loads, the applicant also stated that the stresses due to LOCA loads were calculated and accounted for in the LBB evaluation of the RCS hot leg and cold leg, which has been accepted per the PSL UFSAR for Units 1 and 2 as noted above. In LTR-SDA-21-021-NP, Revision 2, section 6.1 (ML21285A112), the applicant explained that the PSL units were included in the bounding LBB analyses of primary loop piping in the NRC-accepted topical report, CEN-367-A (ML20070S390), and that the analyses remain valid under EPU conditions of the PSL units.

The staff confirmed from the PSL UFSAR that the licensing basis of the PSL units included a loading condition with SSE concurrent with LOCA. With regard to the primary loop piping LBB analyses discussed in LTR-SDA-21-021-NP, Revision 2, referencing topical report CEN-367-A, the staff confirmed that: (a) CEN-367-A is referenced in section 3.6 of the UFSAR of each PSL unit and describes the protection against dynamic effects associated with pipe rupture; (b) the staff has concluded in its EPU license amendment request (LAR) SEs dated July 9, 2012, and September 24, 2012, for Units 1 and 2, respectively (ML12181A019, ML12156A208 and ML12268A167) that the LBB analyses remain valid under EPU conditions of the PSL units; and (c) the applicant has evaluated the LBB analyses for the subsequent period of extended operation as a TLAA (SLRA section 4.7.1) for the RCS hot leg and cold leg piping of the PSL units. The staff's evaluation of SLRA section 4.7.1 is in SE section 4.7.1. Therefore, based on the conservative branch line pipe break loads that were used and the staff's confirmation regarding the primary loop piping LBB analyses, the staff finds that the loading combination of deadweight, thermal, SSE, and LOCA that constitutes the faulted condition selected for stress analysis of the PSL RPV SSSAs is acceptable. However, the aforementioned LOCA loads are replaced with branch line pipe break loads. Therefore, the staff finds that the basis for fracture mechanics evaluation calculated stresses for PSL is the same as that used in the fracture mechanics assessment in the PBN evaluation, and hence, is acceptable.

In SLRA section 3.5.2.2.2.7, the applicant stated that weld residual stress is considered for the evaluation of welds and the heat affected zones of the base metal for the RV SSSAs. In LTR-SDA-21-021-NP, Revision 2, section 7.1, the applicant explained that the PSL RV SSSAs have undergone post-weld heat treatment (PWHT) based on the specifications of the PSL RV SSSAs. During the regulatory audit (ML22188A086), the staff verified in the specifications the applicant cited that the PWHT process was applied to the PSL RV SSSAs. The staff finds that the applicant applied the appropriate weld residual stress values that accounted for stress relief due to the PWHT process, and therefore, its approach for consideration of weld residual stress is acceptable.

The staff reviewed the applicant’s discussion of the FEA of the PSL RV SSSAs as provided in LTR-SDA-21-021-NP, Revision 2, section 6.2, and further clarified in a letter dated July 11, 2022 (ML22192A078), and finds it acceptable because the applicant used the appropriate loads, extracted stresses at the high-stress region for use in fracture mechanics evaluations, and made appropriate computational (FEA) based sensitivity analysis tests to determine the effect(s) of partial penetration welds on the model.

Based on the above discussion, the staff finds that the applicant’s approach for determining stresses at the limiting locations of the PSL RV SSSAs is acceptable.

Assumptions and Conservatisms in RV SSSA Evaluations

In WCAP-18623-NP/P, Revision 1, section 7, the applicant summarized the assumptions and conservatisms in the evaluation of the PSL RV SSSAs. In SLRA section 3.5.2.2.2.7, SLRA Supplement 2 (ML22103A014), the applicant summarized the conservatisms in the structural model of the PSL RV SSSAs. The staff reviewed these assumptions and conservatisms and finds them consistent with those for the PBN evaluation summarized in WCAP-18554-NP/P, Revision 1, section 7, particularly in how stresses were combined and applied. Furthermore, the staff determined in the “*Fracture Toughness of the RV SSSAs*” section above that the additional 25 percent considered in dpa values adds conservatism in the amount of embrittlement, and therefore, in the overall evaluation, of the PSL RV SSSAs. Therefore, the staff finds that the assumptions and conservatisms in the PSL evaluation support the applicant’s comparative ratio approach relative to the PBN evaluation, and hence, are acceptable because they provide margin from potential failure due to loss of fracture toughness through the end of the subsequent period of extended operation. Accordingly, based on these assumptions and conservatisms and the discussions in the “*Neutron Fluence at RV SSSAs*,” “*Fracture Toughness of the RV SSSAs*,” and “*PSL vs PBN RV SSSA Stress Conditions*” sections above, the staff finds the comparative ratios in SLRA table 3.5.2.2-5, Supplement 2 (ML22103A014), acceptable.

The applicant explained in SLRA section 3.5.2.2.2.7, SLRA Supplement 2 (ML22103A014), that per the design specifications of the RV SSSAs, all full-penetration welds and final weld layers were magnetic-particle tested or liquid-penetrant tested, and that ultrasonic tests were performed for completed welds. The applicant stated that these tests were preservice examinations. Additionally, the applicant stated that all welds were “*carefully examined to ensure that there are no slag inclusions, craters, cracks or undercuts. Defects shall be removed by chipping or grinding and then rewelded.*” The applicant also stated that cyclic loading is not applicable to the RV SSSAs per the specifications and the PSL UFSARs. The staff noted that because cyclic loading can lead to crack initiation or growth, and because cyclic loading is not applicable to the RV SSSAs, if there were cracks in the RV SSSAs, they would be defects from initial fabrication and would not be service-induced. Therefore, based on this discussion, the staff determined that the RV SSSAs are reasonably free of detectable cracks.

The staff noted that the applicant did not include the following components of the PSL RV SSSAs as limiting components in SLRA table 3.5.2.2-5, SLRA Supplement 2: columns, base plates located at the bottom of each column, bolts connecting each column and horizontal support assembly, and the anchor bolts at each column base plate. The staff reviewed the information on these components in LTR-SDA-21-021-NP/P, Revision 2 (ML21285A112) and WCAP-18623-NP/P, Revision 1 (ML22103A133 and ML22103A134, respectively), and determined that they are not limiting locations because either: (a) the critical flaw sizes for these components are bounded by the PBN evaluation (bolts connecting each column to its horizontal support assembly); (b) the stresses in these components are in compression (columns); or (c) the fluence level at these components is low (anchor bolts and base plates).

Overall Conclusion

Based on the review of SLRA sections 3.5.2.2.2.6 and 3.5.2.2.2.7, as amended by Supplement 2 (ML22103A014), its enclosures, and the applicant's responses to the staff's concerns addressed in RAIs 3.5.2.2.2.6-1, 3.5.2.2.2.6-2, 3.5.2.2.2.7-1, and 3.5.2.2.2.7-2 (ML22192A078), the staff finds that the applicant:

(a) satisfied the intent of SRP-SLR further evaluation criteria consistent with GALL-SLR Report principles regarding the structural integrity of PSL Units 1 and 2 RV SSSAs and ability to meet their intended function;

(b) has taken appropriate examinations, inspections, and heat-treatment steps during fabrication of the RV SSSAs to ensure their continued safe operation as ASME Class 1 supports;

(c) used a comparative approach for PSL RV SSSAs flaw tolerance versus that calculated for those at PBN conservatively and appropriately for the staff to reasonably ensure that although the effects of aging for reduction of fracture toughness due to irradiation may occur, they will not diminish PSL RV SSSAs' intended structural support function to the end of the subsequent period of extended operation;

(d) to date, has not identified plant-specific OE of RV SSSA indicating degradation due to embrittlement or other synergistic and combined aging effects;

(e) has in place a commitment for each Unit (SLR Commitment 49, appendix A1 and appendix A2, tables 19-3, for Units 1 and 2, respectively) to follow the ongoing industry efforts on effects of irradiation on concrete and associated reactor vessel supports and corresponding aging management recommendations, including reevaluations so that an informed site-specific program be developed, if needed;

(f) proposed continued management of potential effects of aging, such as loss of material using the ASME section XI, subsection IWF, and the BAC AMPs (as applicable), that provides reasonable assurance that the integrity and performance of the RV SSSAs will be monitored and managed adequately such that their intended function will be maintained consistent with the CLB during the subsequent period of extended operation when also considering potential damage due to irradiation exposure; and

(g) has adequately addressed the staff's concerns related to all potential aging effects consistent with SRP-SLR and GALL-SLR Report principles.

Conclusion

Based on the programs identified, the staff concludes that the applicant's program meets the SRP-SLR Section 3.5.2.2.2.7 criteria. For those AMR items associated with SLRA section 3.5.2.2.2.7, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

SE section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.5.2.2.4 Ongoing Review of Operating Experience

SE section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of operating experience.

3.5.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

The following subsections document the staff's review of AMR results listed in SLRA tables 3.5.2-1 through 3.5.2-18 that are either not consistent with or not addressed in the GALL-SLR Report and that are usually denoted with generic notes F through J. To efficiently capture and identify multiple applicable AMR items in each subsection, and because these AMR items often are not associated with a table 1 item, the subsections are organized by applicable AMR sections and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-SLR Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the CLB for the subsequent period of extended operation. The following sections document the staff's evaluation.

3.5.2.3.1 Containment Building Structures – Summary of Aging Management Evaluation – SLRA Table 3.5.2-1

<u>Calcium Silicate Penetrations (Mechanical), Thermal Insulation (Type I Hot Penetrations) Exposed to Air-Indoor Uncontrolled Environment</u>

SLRA table 3.5.2-1, item 3.4-1, 064, states that reduced thermal insulation resistance due to moisture intrusion for calcium silicate thermal insulation exposed to uncontrolled indoor air is not applicable, and no AMP is proposed. The AMR item cites generic note I, and plant-specific note 5, which states, "Insulation for main steam and feedwater penetrations are fully encased in the multiple flued head and guard pipes and there are no plausible moisture, contaminants, or exposures that could degrade the (calcium silicate) insulation." The staff reviewed the associated items in the SLRA to confirm that this aging effect is not applicable for this component, material, and environment combination. The staff finds the applicant's proposal acceptable based on the review of plant-specific OE that did not reveal any evidence of insulation penetration wetting on the reactor coolant piping that passes through the primary shield wall.

<u>Stainless Steel Pressure-Retaining Bolting Exposed to Air-Indoor Uncontrolled Environment</u>

SLRA table 3.5.2-1 states that aging effects of loss of material and loss of preload for the SS pressure-retaining bolting exposed to air-indoor uncontrolled environments will be managed by the ASME section XI, subsection IWE program. The AMR items cite generic note F. In addition, the AMR items cite plant-specific note 6, which states: "SS penetration assemblies include SS pressure-retaining bolting that is managed by the ASME Section XI, Subsection IWE AMP."

The staff reviewed the associated items in the SLRA and considered whether the aging effects proposed by the applicant constitute all of the applicable aging effects for this component, material, and environment description. The staff searched aging effects for the SS pressure-retaining bolting exposed to air-indoor uncontrolled environments in the GALL-SLR report and identified that cracking due to SCC is also an applicable aging effect in addition to loss of material and loss of preload. The staff finds that the applicant has explicitly identified all applicable aging effects for this component, material, and environment combination with the exception of cracking due to SCC. The staff, nevertheless, finds the applicant’s proposal to use the ASME section XI, subsection IWE program to manage aging effects of loss of material and loss of preload, as well as cracking due to SCC, acceptable because: (1) the ASME section XI, subsection IWE program conducts periodic VT-1 examinations to assess the condition of containment pressure-retaining bolting in accordance with examination category E-G, which is capable of detecting aging effects of loss of material and loss of preload as well as cracking due to SCC; (2) plant OE has not identified any indications of cracking due to SCC for the pressure-retaining bolting at the plant site; and (3) the applicant will also perform leak rate testing of penetrations with pressure-retaining bolting in accordance with the 10 CFR part 50, appendix J program, which is another method recommended in the GALL-SLR report capable of detecting cracking due to SCC.

<u>Steel RV Supports and Bolting Exposed to Air-Indoor Uncontrolled Environment</u>

SLRA table 3.5.2-1 states that the ASME section XI, subsection IWF AMP will manage loss of fracture toughness aging effects for steel RV supports and bolting exposed to an air-indoor uncontrolled environment. The AMR item cites generic note H, for which the applicant has identified loss of fracture toughness due to irradiation embrittlement as an additional aging effect. The AMR item cites plant-specific note 8, which states, “The loss of fracture toughness aging effect due to irradiation embrittlement of the steel reactor vessel supports and bolting is addressed in Section 3.5.2.2.2.7 and is managed by the ASME Section XI, Subsection IWF (B.2.3.30) AMP.”

The plant-specific fracture mechanics evaluation in SLRA section 3.5.2.2.2.7, as amended by Supplement 2 dated April 13, 2022 (ML22103A014), further clarified by letter dated July 11, 2022 (ML22192A078), and the staff evaluation in SE section 3.5.2.2.2.7 concluded that there is a sufficient level of flaw tolerance demonstrated in the RV supports (including bolting) considering 80 calendar years (72 EFPY) of radiation embrittlement effects. Therefore, the continuing adequacy of the current visual examination (VT-3) of the RV structural steel supports as part of the SLRA B.2.3.30 ASME section XI, subsection IWF program is justified. The staff finds the applicant's proposal to manage the loss of fracture toughness due to irradiation embrittlement of the RV supports acceptable because (1) the plant-specific fracture mechanics evaluation in SE section 3.5.2.2.2.7 demonstrated that a plant-specific program is not necessary to manage the aging effect; (2) the ASME section XI, subsection IWF AMP (evaluated in SE section 3.0.3.2.25) VT-3 visual examinations of RV supports, along with additional volumetric examinations, on a sampling basis, of high-strength bolting (SLR Commitment 33(h) in table 19-3 of SLRA appendix A1 and table 19-3 of SLRA appendix A2), are sufficient to monitor for cracking as a potential symptom(s) of loss of fracture toughness through the subsequent period of extended operation; and (3) SLR Commitment 49 in table 19-3 of SLRA appendix A1 and table 19-3 of SLRA appendix A2 assures that changes may be made to the program based on ongoing research or future OE, if applicable and needed.

3.6 Aging Management of Electrical and Instrumentation and Controls

3.6.1 Summary of Technical Information in the Application

SLRA section 3.6, "Aging Management of Electrical and Instrumentation & Controls," provides AMR results for those components the applicant identified in SLRA section 2.5, "Scoping and Screening Results: Electrical and Instrumentation & Controls," as being subject to an AMR. SLRA table 3.6-1, "Summary of Aging Management Evaluations for Electrical and Instrumentation & Control Commodities," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for electrical components.

3.6.2 Staff Evaluation

Table 3.6-1, below, summarizes the staff's evaluation of the component groups listed in SLRA section 3.6 and addressed in the GALL-SLR Report.

Table 3.6-1 Staff Evaluation for Electrical Components in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.6.1-001	Consistent with the GALL-SLR Report (see SER section 3.6.2.2.1)
3.6.1-002	Consistent with the GALL-SLR Report
3.6.1-003	Consistent with the GALL-SLR Report
3.6.1-004	Not applicable to PSL (see SER section 3.6.2.1.1 and 3.6.2.2.3)
3.6.1-005	Not applicable to PSL (see SER section 3.6.2.1.1 and 3.6.2.2.3)
3.6.1-006	Not applicable to PSL (see SER section 3.6.2.1.1 and 3.6.2.2.3)
3.6.1-007	Not applicable to PSL (see SER section 3.6.2.1.1 and 3.6.2.2.3)
3.6.1-008	Consistent with the GALL-SLR Report
3.6.1-009	Consistent with the GALL-SLR Report
3.6.1-010	Consistent with the GALL-SLR Report
3.6.1-011	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.6.1-012	Consistent with the GALL-SLR Report
3.6.1-013	Consistent with the GALL-SLR Report
3.6.1-014	Consistent with the GALL-SLR Report
3.6.1-015	Consistent with the GALL-SLR Report
3.6.1-016	Not applicable to PSL (see SER section 3.6.2.1.1)
3.6.1-017	Not applicable to PSL (see SER section 3.6.2.1.1)
3.6.1-018	Not applicable to PSL (see SER section 3.6.2.1.1)
3.6.1-019	Consistent with the GALL-SLR Report
3.6.1-020	Consistent with the GALL-SLR Report
3.6.1-021	Not applicable to PSL (see SER sections 3.6.2.1.1 and 3.6.2.2.3)
3.6.1-022	Not applicable to PSL (see SER section 3.6.2.1.1)
3.6.1-023	Consistent with the GALL-SLR Report
3.6.1-024	Consistent with the GALL-SLR Report
3.6.1-025	This item number is not used in the SRP-SLR nor in the GALL-SLR Report
3.6.1-026	This item number is not used in the SRP-SLR nor in the GALL-SLR Report
3.6.1-027	Not applicable to PSL (see SER sections 3.6.2.1.1 and 3.6.2.2.2)
3.6.1-028	This item number is not used in the SRP-SLR nor in the GALL-SLR Report
3.6.1-029	Not applicable to PSL (see SER sections 3.6.2.1.1 and 3.6.2.2.2)
3.6.1-030	Consistent with the GALL-SLR Report (see SER section 3.6.2.2.2)
3.6.1-031	Consistent with the GALL-SLR Report (see SER section 3.6.2.2.2)
3.6.1-032	Not applicable to PSL (See SER section 3.6.2.1.1)

The staff’s review of component groups, as described in SE section 3.0.2.2 is summarized in the following two sections:

(1) SE sections 3.6.2.1 and 3.6.2.1.1 discuss AMR results for components that the applicant states are either not applicable to PSL or are consistent with the GALL-SLR Report.

(2) SE section 3.6.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

3.6.2.1 Aging Management Review Results Consistent with the GALL-SLR Report

The following subsections document the staff’s review of AMR results listed in SLRA tables 3.6-1 and 3.6.2-1, “Electrical and Instrumentation & Control Commodities – Summary of Aging Management Evaluation,” that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat the review of the matters described in the GALL-SLR Report. The staff verified that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items the staff found to be consistent with the GALL-SLR Report, and for which no additional evaluation or request for additional information applies, the staff’s review and conclusions as documented in the GALL-SLR Report are considered to be the basis for acceptability of the AMR items. The staff’s conclusion of “Consistent with the GALL-SLR Report” is documented in SE table 3.6-1, and no separate writeup is required or provided. The staff did not identify any AMR items that required additional review with an associated writeup.

SE section 3.6.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable.

3.6.2.1.1 Aging Management Review Results Identified as Not Applicable or Not Used

For SLRA table 3.6-1, items 3.6-1, 004; 3.6-1, 005; 3.6-1, 006; 3.6-1, 007; 3.6-1, 016; 3.6-1, 017; 3.6-1, 018; 3.6-1, 021; 3.6-1, 022; 3.6-1, 027; 3.6-1, 029; and 3.6-1, 032, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to PSL. The staff reviewed the SLRA and UFSAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable.

For items 3.6-1, 016, 017, 018, and 022, SLRA Supplement 1, section 2.5.1.3, "Elimination of Electrical and I&C Commodity Groups Not Applicable to St. Lucie," and section 3.6.1.1, "Electrical Commodity Groups Not Requiring Aging Management," discussed the AMR for new fuse holders (not part of active equipment) that are in a junction box, which was added to the Unit 2 6.9-kilovolt (kV) switchgear room (for 125 volts direct current control power circuits) after the initial license renewal. The applicant stated that the junction box is in a benign environment and contains only fuses, fuse holders, and wiring, and the fuse holders do not experience relevant aging mechanisms or aging effects relative to their insulating materials and metallic clamps (i.e., there are no stressors to cause corrosion or age-related degradation). The applicant also noted that these new fuse holders are not exposed to environmental stressors (thermal, radiation, or moisture), are not subject to electrical stress (high voltage, high cycling, or high heating), and are not manipulated. The applicant concluded that because these fuse holders do not have relevant aging mechanisms, are not manipulated, and are not subject to aging effects, they do not require aging management consistent with the guidance of NUREG-2191, chapter VI, table A, "Equipment Not Subject to 10 CFR 50.49, Environmental Qualification Requirements," for AMP XI.E5 – Fuse Holders, and do not require an aging management program at PSL.

SLRA Revision 1, table 3.6 -1, "Summary of Aging Management Evaluation for Electrical and Instrumentation & Control Commodities," and SLRA Revision 1, Supplement 1, Attachment 3, table 3.6.2-1, "Electrical and Instrumentation & Control Commodities – Summary of Aging Management Evaluation," provided a summary of the evaluation for the fuse holders' metallic clamps (table items 3.6-1, 016, 017, and 018) and fuse holders' insulation materials (table item 3.6-1, 022) with respect to the aging effects and mechanisms listed in NUREG-2191, table A, AMP XI.E5.

In response to RAI 3.6.1.1-1 (ML22221A134), the applicant revised SLRA table 3.6-1 and table 3.6.2-1 and provided a summary of the evaluation performed to demonstrate that the fuse holders, which are in an air-indoor uncontrolled environment in the turbine building, are not subject to the aging effects and mechanisms identified in NUREG-2191, table A, AMP XI.E5. The applicant provided the following additional information:

- For the metallic clamps: there are no potential sources of chemical contamination in the area; the moisture required to produce corrosion and oxidation is not present in the area; there are no sources of potential mechanical system leakage in proximity to the fuse holders; the gasketed design of the enclosure protects against the ingress of liquids and foreign contamination; the fuse holders experience a very low current draw (4 amperes steady state) under normal operation and are used in control power applications that are cycled once per fuel cycle; stresses due to forces associated with electrical faults and transients are mitigated by the proper coordination and fast action of circuit protective devices at high currents; there are no direct sources of vibration acting on the enclosure.

- For the insulation materials: the insulation materials will not degrade at high temperatures or in the presence of pollution or ultraviolet light based on experience; condensation does not form on the warm equipment surfaces in the switchgear room and the metallic clamps of the fuse holders are constructed of corrosion-resistant material; the 80-year service-limiting radiation dose in the turbine building and temperature limit in the switchgear room are below the 80-year service-limiting radiation thresholds and the service-limiting temperature thresholds, respectively, for these insulation materials.

The staff reviewed the above information related to the AMR and aging management evaluation for the in-scope fuse holders and finds that the metallic clamps of the fuse holders are not exposed to chemical contamination, corrosion, and oxidation and do not experience fatigue from thermal cycling, ohmic heating, electrical transients, and frequent manipulation or vibration due to their location, their design, and the design of their enclosure. The staff also finds that the insulation materials of the fuse holders do not experience thermal or thermoxidative degradation, radiolysis, radiation-induced oxidation, and moisture intrusion due to their properties, their location, and their environmental stressor limits. Therefore, the staff concludes that the aging effects and mechanisms requiring aging management in NUREG, table A, AMP XI.E5 are not applicable to PSL in-scope fuse holders.

For SLRA table 3.6-1, item 3.6-1, 029, the applicant performed a further evaluation of a plant-specific AMP, as described in section 3.6.2.2.2, in accordance with GALL-SLR and determined that a plant-specific AMP was not applicable. For SLRA table 3.6-1, item 3.6-1, 027, no further evaluation was recommended. As a result, the applicant proposed no AMPs for the component, material, and environment combination. These AMR items cited generic note I, which states that the aging effect in NUREG-2191 for this component, material, and environment combination is not applicable. The staff's evaluation of the applicant's claim regarding SLRA table 3.6.2-1 is documented in SE section 3.6.2.2.2.

3.6.2.2 Aging Management Review Results for which Further Evaluation is Recommended by the GALL-SLR Report

In SLRA section 3.6.2.2, the applicant further evaluates aging management for certain electrical and instrumentation and controls system components as recommended by the GALL-SLR Report and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR section 3.6.2.2. The following subsections document the staff's review.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

SLRA section 3.6.2.2.1, associated with SLRA table 3.6-1 item 3.6.1, 001, states that TLAAs are defined in 10 CFR 54.3 and evaluated in accordance with 10 CFR 54.21(c). The applicant's evaluation of this TLAA is addressed in section 4.4. This is consistent with SRP-SLR section 3.6.2.2.1, which states that TLAAs, as defined in 10 CFR 54.3, are evaluated in accordance with 10 CFR 10 54.21(c)(1) and are therefore acceptable. The staff's evaluation of the TLAA for environmental qualification of electrical equipment is documented in SE section 4.4.

3.6.2.2.2 Reduced Insulation Resistance Due to Age Degradation of Cable Bus Arrangements Caused by Intrusion of Moisture, Dust, Industrial Pollution, Rain, Ice, Photolysis, Ohmic Heating, and Loss of Strength of Support Structures and Louvers of Cable Bus Arrangements Due to General Corrosion and Exposure to Air-Outdoor

SLRA section 3.6.2.2.2 is associated with SLRA table 3.6-1 items 027, 029, 030, 031, and 032. This section addresses reduced insulation resistance due to age degradation of cable bus arrangements caused by intrusion of moisture, dust, industrial pollution, rain, ice, photolysis, ohmic heating, and loss of strength of support structures and louvers of cable bus arrangements due to general corrosion and exposure to air-outdoor environments. The applicant noted that table 3.6-1 items 3.6-1, 027 and 3.6-1, 032 are consistent with GALL-SLR chapter VI, table A; there are no aging effects requiring management; and further evaluation is not applicable at PSL. The following discussion summarizes the staff's review of each of the AMR items.

SLRA section 3.6.2.2.2 stated:

> PSL is currently in the process of replacing all metal enclosed bus (6.9 kV [not within the scope of SLR] and 4.16 kV [within the scope of SLR]) with cable bus (either 750 MCM or 500 MCM medium-voltage power cable). This work began in 2019 and is being performed in a portioned approach, with completion estimated sometime after the submittal of the SLRA. Therefore, cable bus is applicable to the electrical aging management review for PSL. The MV power cable utilized for this commodity group has a Chlorinated Polyethylene (CPE) jacket and EPR insulation.
>
> The in-scope cable bus is routed from the Start-Up Transformers (1A / 1B / 2A / 2B) to the 4.16 kV switchgear (1A2 / 1B2 / 2A2 / 2B2 / 2A4 / 2B4). The cable runs through a ductwork enclosure fabricated of aluminum, with louvered (slotted) bottom panels, and solid sides and top covers. The duct supports are fabricated of steel. The cable bus is run both indoors and outdoors at PSL.

The SLRA addressed two elements—loss of resistance (insulation degradation) and degradation of connection/loss of torque (cable connections)—associated with this AMP individually.

<u>Loss of Resistance (Insulation Degradation)</u>. The SLRA states "The cable bus is routed above ground, in aluminum ductwork, and the cable sections are supported (internal to the duct) by solid epoxy (cycloaliphatic) supports, with holes for the cable to pass through, approximately 6 to 8 feet apart. These feed-through supports have excellent compressive strength and have been in widespread use in electrical bus work since about 1975." The applicant noted that the widespread industry experience with cycloaliphatic epoxy insulators or very similar porcelain insulators has demonstrated their ability to resist degradation. Since the bottom panels have louvers, in general, moisture accumulation is precluded. For the outside installations, the cable bus will be exposed to ambient temperature and humidity, but the cable jacket and insulation offer adequate protection.

The cable bus routed indoors is a similar design and routed above ground. The same duct design is used, with louvers (slots) in the bottom panels. The indoor cable bus system may be exposed to minor dust accumulation and the indoor environment benign. The applicant has concluded, "Therefore, there are no aging mechanisms present to cause degradation of the insulated cable bus (in its ductwork installation).” Therefore, the staff finds that item 3.6-1, 029 was determined to be not applicable and the further evaluation performed by the applicant is consistent with GALL.

Degradation of Connection/Loss of Torque (Cable Connections). The applicant noted that cable connections for the in-scope insulated cable bus, at the termination ends of the power cables, use hardware that includes Belleville (conical) washers, which prevent the degradation of the mechanical connections. The applicant also noted that it performs routine thermography inspections on medium-voltage electrical terminations (at the transformers and the switchgear) to identify any possible points of increased resistance.

The staff reviewed the electrical system drawings and descriptions provided in the UFSAR and conducted an onsite audit (December 2021) to verify the material condition of the in-scope electrical systems and conductors as described in the SLRA. The staff audited major components identified in the SLRA and discussed the maintenance and monitoring practices at PSL. The staff noted that PSL has an extensive monitoring and maintenance program for electrical equipment exposed to an external environment given the location of the PSL Units, which experience severe weather and a salt-laden environment. The staff also noted that the existing portions of the cable bus arrangements at PSL are recent installations with no indications of degradation or aging. The staff finds the applicant’s proposal acceptable because the in-scope cable bus system at PSL is generally in good condition and some sections have been recently installed. The applicant’s current practices provide reasonable assurance that the intended functions of cable bus conductors associated with offsite power sources will be adequately maintained during the period of subsequent period of extended operation. Therefore, the staff finds that item 3.6-1, 027 is not applicable.

For SLRA table 3.6-1 items 3.6-1, 030 and 031, the cable bus ductwork itself (and its external supports and any joints or seals between duct sections) will be addressed by the structures monitoring AMP (B.2.3.33), for any applicable aging management.

Conclusion. Based on the audit and review of the SLRA, the staff concludes that the applicant has met the SRP-SLR section 3.6.2.2.2 criteria. For SLRA table 3.6-1 items 3.6-1, 001, 029, 030, and 031, the staff finds that the SLRA is consistent with GALL-SLR Report recommendations, and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.3 Loss of Material Due to Wind-Induced Abrasion, Loss of Conductor Strength Due to Corrosion, and Increased Resistance of Connection Due to Oxidation or Loss of Preload for Transmission Conductors, Switchyard Bus, and Connections

SLRA section 3.6.2.2.3 is associated with SLRA table 3.6-1 items 3.6-1, 004; 3.6-1, 005; 3.6-1, 006; 3.6-1, 007; and 3.6-1, 021 and addresses loss of conductor strength due to corrosion, increased resistance of connection due to oxidation or loss of preload, and loss of material due to wind-induced abrasion in transmission conductors, transmission connections, and switchyard buses and connections. The criteria in SRP-SLR section 3.6.2.2.3 state that the GALL-SLR Report recommends further evaluation of a plant-specific AMP to ensure that the aging effects are adequately managed. For SLRA Table 3.6-1, item 3.6-1, 021, no further evaluation was recommended. This item also cited generic note I, which states that the aging effect in NUREG-2191 for this component, material, and environment combination is not applicable.

Acceptance criteria are described in BTP RLSB-1 (appendix A.1 of the SRP-SLR). A discussion of these AMR items is provided as follows.

Transmission Conductors Composed of Aluminum and Steel Exposed to Air-Outdoor.

SLRA Section 3.6.2.2.3 addressed the aging effect of loss of conductor strength due to corrosion in transmission conductors composed of aluminum that are exposed to air-outdoor environment. This section states:

> Transmission conductors are subject to aging management review if they are necessary for recovery of offsite power following an SBO event. The PSL power path for restoration of offsite power following an SBO event utilizes line connections of 1081 MCM all aluminum alloy conductor (AAAC) to connect the Unit 1 and Unit 2 230 kV switchyard circuit breakers to the high-voltage station startup transformers on each unit. The Unit 1 and Unit 2 circuit breakers (on switchyard Bays 2 and 4) demarcate the SBO switchyard boundary for SLR. Other PSL transmission conductors (and pathways -such as those through the Unit auxiliary transformers) are not subject to aging management review since they do not perform or support SLR intended functions. The offsite Preferred Power pathway for PSL is through Bay 2 and Bay 4 of the switchyard to the Start-Up Transformers.
>
> Switchyard bus is the uninsulated, unenclosed, rigid electrical conductor or pipe used in switchyards and switching stations to connect two or more elements of an electrical power circuit, such as active disconnect switches and passive transmission conductors. Switchyard bus includes the hardware used to secure the bus to high-voltage insulators. Switchyard bus is subject to aging management review if it is necessary for recovery of offsite power following an SBO event. At PSL, switchyard bus from the 230 kV circuit breakers to the high-voltage station startup transformers on each Unit support SBO recovery. Other switchyard bus is not subject to aging management review since it does not perform or support SLR intended functions.

The SLRA addressed the three elements—loss of material due to wind-induced abrasion, loss of conductor strength due to corrosion, and increased resistance of connection due to oxidation or loss of preload—associated with this further evaluation individually.

Loss of Material (Wear). This aging effect is associated with wind loading that can cause transmission conductor vibration, or sway. The applicant stated that at PSL, the connections between the 230-kV circuit breakers and the high-voltage station startup transformers are made by a short length (~800 ft.) of all aluminum alloy conductor (AAAC) overhead transmission lines and as such are not subject to wind loading that can cause a transmission line and insulators to vibrate or sway. The applicant has concluded that in view of the relatively short length of transmission conductor lines used at PSL, "loss of material (wear) and fatigue that could be caused by transmission conductor vibration or sway are not aging effects requiring management because they are precluded by the length of the PSL transmission conductor lines." The SLRA further states, "A review of industry OE and NRC generic communications related to the aging of transmission conductors confirmed that no additional aging effects exist beyond those previously identified." The applicant has concluded that loss of material due to wear of transmission conductors and switchyard bus is not an aging effect requiring management at PSL.

NRC Special Inspection Report 05000269/2016008 and 05000287/2016008 (ML16057A062) documents an event at Oconee Nuclear Station where a short overhead conductor disconnected at the phase bushing associated with an offsite power system transformer. The applicant's extent-of-condition reviews discovered broken power feed cable strands on all three phases of the transformer. The staff noted that overhead transmission conductor vibrations are subject to Aeolian vibrations, sub conductor oscillations, and galloping. Power line conductors experience fatigue due to the Aeolian vibration. Aeolian vibration is caused by the vortices produced due to air flow and conductor interaction. Fretting is caused by the small relative movement between wires and by the contact between the conductor and the suspension hardware such as clamps, spacers, dampers, etc. The SLRA states, "A review of PSL plant-specific OE did not identify any unique aging effects for transmission conductors."

The SLRA stated that the switchyard bus is connected to active equipment by short sections of flexible conductors and the rigid bus structure does not vibrate due to concrete footing and steel footing. The flexible conductors dampen the minor vibrations associated with the active switchyard components to the switchyard bus. The applicant has concluded "As a result, loss of material (wear) caused by switchyard bus vibration is not an aging effect requiring management because it is precluded by design."

The staff reviewed the electrical system drawings and descriptions provided in the UFSAR and conducted an onsite audit to verify the extent of the in-scope transmission conductors as described in the SLRA. The staff reviewed the major components identified in the SLRA and discussed the switchyard maintenance and monitoring practices at PSL. The staff noted that PSL has an extensive monitoring and maintenance program for switchyard equipment given the location of the PSL Units, which experience severe weather and a salt-laden environment. The staff finds the applicant's current monitoring and maintenance program for switchyard equipment acceptable because the in-scope transmission conductors at PSL are generally in good condition, and the applicant's current practices provide reasonable assurance that the conductors associated with offsite power source will have adequate strength maintained during the subsequent period of extended operation.

Loss of Conductor Strength (Corrosion). The SLRA stated that this aging effect applies to the short length (~800 ft.) transmission line connections of 1081 thousands of circular mils (MCM) AAAC cable between the Unit 1 and Unit 2 230-kV circuit breakers and each unit's high-voltage station startup transformer used for recovery of offsite power following an SBO event.

The SLRA states:

> The most prevalent mechanism contributing to loss of conductor strength of an AAAC transmission conductor is corrosion, which includes corrosion of the aluminum strand. AAAC transmission conductor is more corrosion resistant than ACSR [aluminum conductor steel reinforced] cable and has a higher strength-to-weight ratio. AAAC cable is better suited for coastal installation due to its superior corrosion resistance. AAAC is also better suited for use in industrial areas. In fact, with respect to corrosion resistance, aluminum is more resistant than steel. Aluminum quickly forms an oxide layer which protects the material underneath and this layer will re-form if damaged (in the absence of environmental stress). A layer of approximately 1 nanometer (10 angstroms) is sufficient to protect the metal underneath. Aluminum is lighter than steel and provides a much higher strength-to-weight ratio. The AAAC conductor therefore is more resistive to corrosion and to loss of conductor strength than the ACSR conductor.

> AAAC has a lower resistance than ACSR (with no steel) but has 15 percent-20 percent better conductivity and a longer life than ACSR. Corrosion in AAAC conductors is a very slow-acting aging mechanism with the corrosion rate depending largely on air quality. Air quality factors include suspended particle chemistry, sulfur dioxide (SO2) concentration, precipitation, fog chemistry, seaside atmospheric conditions, and general meteorological conditions. Air quality in rural areas, such as the area surrounding PSL, generally contains low concentrations of suspended particles and SO2, which minimize the corrosion rate. There are no major industries within the immediate vicinity of PSL.

The applicant has referenced the National Electrical Safety Code (NESC) and an Ontario Hydro study (found to be acceptable by the NRC) to establish the periodicity at which the composite conductor should be replaced. The SLRA states, "The NESC maximum design loading for the AAAC conductor is 16,000 lbs. The ultimate strength for the 1081 MCM AAAC line is 35,150 lbs." Based on the information provided in the Ontario Hydro report and the NESC guidance, the applicant has stated, "In the case of the 37-strand AAAC transmission conductors, a 30 percent of ultimate strength would mean that there still is a 53 percent margin between the age-reduced ultimate strength (24,605 lbs.) and the NESC required limit of 16,000 lbs." and concluded that loss of conductor strength is not an aging effect requiring management for transmission conductors at PSL.

The Ontario Hydro report discusses environmental aging effects on aluminum conductor steel reinforced type of overhead conductors. The staff noted that AAAC conductors are less likely to experience corrosion due to lack of steel material, and therefore, the Ontario Hydro study could be considered bounding for PSL. Therefore, the staff concludes that loss of conductor strength due to corrosion is not an aging effect requiring management for transmission conductors at PSL for the subsequent period of extended operation.

<u>Increased Resistance of Connection (Corrosion)</u>. The SLRA stated that increased connection resistance due to surface oxidation is an applicable aging effect. The applicant has concluded that this degradation is not significant enough to cause a loss of intended function. The aluminum, copper, and aluminum alloy components in the PSL switchyard are exposed to precipitation and experience minor oxidation. The SLRA stated, "At PSL, switchyard connection surfaces are coated with an antioxidant compound (i.e., a grease-type sealant) prior to tightening the connection to prevent the formation of oxides on the metal surface and to prevent moisture from entering the connections, thus minimizing the potential for corrosion."

The applicant has also stated that PSL periodically performs infrared inspections of the 230-kV switchyard connections to verify the integrity of the connections.

Based on the maintenance practices at PSL, the staff concludes that increased connection resistance due to general corrosion resulting from oxidation of switchyard connection metal surfaces is not an aging effect requiring additional management at PSL through the subsequent period of extended operation.

<u>Increased Resistance of Connection (Loss of Preload)</u>. The SLRA stated that increased connection resistance due to loss of pre-load (torque relaxation) for switchyard connections is not an aging effect requiring management. The applicant has described the design of transmission conductor and switchyard bus bolted connections using Belleville washers and an anti-oxidant compound, which precludes torque relaxation.

The licensee performs routine inspections of the PSL 230-kV switchyard and startup transformers and performs periodic infrared inspections of this power path to verify the integrity of the connections. The staff agrees that the type of bolting plate and the use of Belleville washers is the industry standard to preclude torque relaxation, and increased connection resistance due to loss of pre-load on switchyard connections is not an aging effect requiring management. Based on the configuration of the bolted connections and current maintenance activities, the staff concludes that there are no additional actions needed to consider aging effects that require management for PSL transmission conductors and switchyard bus connections through the subsequent period of extended operation.

Conclusion. Based on the audit and review of the SLRA, the staff concludes that the applicant has met the SRP-SLR section 3.6.2.2.3 criteria. For those items that apply to SLRA section 3.6.2.2.3, the staff finds that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

SE section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.6.2.2.5 Ongoing Review of Operating Experience

SE section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of operating experience

3.7 Conclusion for Aging Management Review Results

The staff reviewed SLRA section 3, "Aging Management Review Results," and SLRA appendix B, "Aging Management Programs," as supplemented. Based on the audit and the review of the applicant's AMRs results and AMPs, the staff concludes that the applicant has demonstrated that it will adequately manage the applicable aging effects in a way that maintains intended functions consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicant's applicable UFSAR supplement program summaries and concludes that, as required by 10 CFR 54.21(d), the UFSAR supplement adequately describes the AMPs and activities credited for managing aging at St. Lucie.

With regard to these matters, the staff concludes that actions have been identified and have been or will be taken such that there is reasonable assurance that the activities authorized by subsequent renewed operating licenses for St. Lucie Units 1 and 2, if issued, will continue to be conducted in accordance with the CLB, and that any changes made to the CLB to comply with 10 CFR part 54 are in accordance with the Atomic Energy Act of 1954, as amended, and the NRC's regulations.

SECTION 4 TIME-LIMITED AGING ANALYSES

4.1 Identification of Time-Limited Aging Analyses

This section of the safety evaluation (SE) provides the Nuclear Regulatory Commission (NRC) staff's evaluation of the applicant's basis for identifying those time-limited aging analyses (TLAAs) and plant-specific exemptions, granted pursuant to 10 CFR 50.12, "Specific Exemptions," and in effect that are based on TLAAs.

The regulation in 10 CFR 54.3, "Definitions," defines TLAAs as those licensee calculations and analyses (henceforth referred to as "analysis" or "analyses") that:

(1) Involve systems, structures, and components (SSCs) 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 (for initial license renewal or 60 years for subsequent license renewal [SLR]);

(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 SSC 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 (CLB).

The regulation in 10 CFR 54.21(c)(1) requires an applicant for SLR to provide a list of TLAAs as defined in 10 CFR 54.3 and demonstrate that:

(i) The analyses remain valid for the [subsequent] period of extended operation;
(ii) The analyses have been projected to the end of the [subsequent] period of extended operation; or
(iii) The effects of aging on the intended function(s) will be adequately managed for the [subsequent] period of extended operation.

In addition, in accordance with 10 CFR 54.21(c)(2), an applicant for SLR must provide a list of plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on TLAAs. The applicant must provide an evaluation that justifies the continuation of these exemptions for the subsequent period of extended operation.

4.1.1 Summary of Technical Information in the Application

Subsequent license renewal application (SLRA) section 4.1 describes the process used by the applicant to identify the TLAAs within the applicant's CLB and design basis documentation. The applicant identified the CLB and design basis documentation that was reviewed and searched to identify potential TLAAs. The document search was performed consistent with the guidance provided in NEI 17-01, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal"; NUREG-2191, "Generic Aging Lessons Learned for

Subsequent License Renewal (GALL-SLR) Report"; and NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (SRP-SLR).

In addition, the applicant stated that it reviewed the St. Lucie CLB as required by 10 CFR 54.21(c)(2) to identify all plant-specific exemptions granted under 10 CFR 50.12, "Specific Exemptions," and in effect that are based on TLAAs. The applicant stated that it identified two plant-specific exemptions based on a TLAA, and these are both related to pressure-temperature limits.

4.1.2 Staff Evaluation

The NRC staff reviewed SLRA section 4.1 in accordance with the guidance provided in SRP-SLR section 4.1, "Identification of Time-Limiting Aging Analyses and Exemptions." Specifically, SRP-SLR section 4.1.1 summarizes the areas of review. In addition, SRP-SLR section 4.1.2 summarizes the staff's acceptance criteria for performing TLAA and SLRA exemption identification reviews, and section 4.1.3 summarizes the staff's review procedures for performing the TLAA and SLRA exemption identification reviews.

SRP-SLR table 4.1-1 provides a sample process for identifying potential TLAAs. SRP-SLR table 4.1-2 provides a list of generic TLAAs. SRP-SLR table 4.7-1 provides examples of potential plant-specific TLAAs that have been identified by license renewal applicants. The staff used the guidance and information in these SRP-SLR tables to assist its review in determining whether the applicant identified all applicable calculations and analyses in its CLB as TLAAs in its SLRA.

The SLRA states that the applicant searched the CLB and design basis documentation to identify potential TLAAs. The documentation that was searched included the following: updated final safety analysis report (UFSAR), Technical Specifications (TS) and bases, Technical Requirements Manual, docketed licensing correspondence, NRC SEs, design basis documents, fire protection plan/hazards analyses, Westinghouse design analyses and reports, vendor design analyses and reports, environmental qualification (EQ) documentation packages, design specifications, and 10 CFR 50.12 exemption requests.

During the onsite audit (as described in the audit report (ML22188A086)), the staff confirmed that the applicant performed a search of its CLB and design basis documentation to identify potential TLAAs. It was noted that a list of specific key words was used during this search to identify potential TLAAs. The staff also confirmed that each potential TLAA identified during the applicant's search was reviewed against the six criteria of 10 CFR 54.3(a) and that those potential TLAAs that met all six criteria were identified as TLAAs that require evaluation for the subsequent period of extended operation.

During its audit, the staff also confirmed that the applicant performed a search of docketed licensing correspondence, the operating license, and the UFSAR to identify exemptions granted pursuant to 10 CFR 50.12 that are currently in effect. The staff also confirmed that these exemptions were then reviewed to determine whether the exemption was based on a TLAA, and that two 10 CFR 50.12 exemptions involve a TLAA as defined in 10 CFR 54.3. The staff noted that these exemptions based on a TLAA are addressed in SLRA section 4.2.5 and are related to the pressure-temperature limits for Unit 1 and Unit 2. The staff's review of the TLAA related to pressure-temperature limits is documented in section 4.2.5.

During its review, the staff performed an independent search of the UFSAR and a sample of docketed licensing correspondence and NRC SEs to identify potential TLAAs. Based on this independent search, the staff did not identify TLAAs that were not already identified in the SLRA by the applicant.

4.1.3 Conclusion

Based on its review and independent search, the staff concludes that the systematic approach the applicant took to search its CLB and design basis documentation identified the analyses that meet all six criteria of a TLAA, in accordance with 10 CFR 54.21(c)(1). In addition, based on its review and independent search, the staff finds that the systematic approach taken by the applicant to search its CLB for exemptions that were based on a TLAA is acceptable. Thus, the staff finds that the applicant identified the plant-specific exemptions granted pursuant to 10 CFR 50.12, and in effect that are based on a TLAA, as required by 10 CFR 54.21(c)(2); these exemptions are further addressed in SE section 4.2.5.

4.2 Reactor Vessel Neutron Embrittlement Analysis

4.2.1 Neutron Fluence Projections

4.2.1.1 Summary of Technical Information in the Application

SLRA section 4.2.1 describes the applicant's TLAA for neutron fluence projections for St. Lucie Units 1 and 2. The applicant dispositioned this TLAA for the reactor pressure vessel (RPV) beltline and extended beltline materials in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of aging due to fluence on the intended functions will be adequately managed by the neutron fluence monitoring aging management program (AMP) (SLRA section B.2.2.2) and the reactor vessel material surveillance AMP (SLRA section B.2.3.19) for the subsequent period of extended operation.

4.2.1.2 Staff Evaluation

The NRC staff reviewed the applicant's TLAA for the RPV beltline and extended beltline materials and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR section 4.2.3.1.1.3 and the acceptance criteria in SRP-SLR section 4.2.2.1.1.3.

The staff noted that updated neutron fluence evaluations were performed and documented in Westinghouse LTR-REA-21-1-NP, Revision 1, "St. Lucie Units 1 & 2 Subsequent License Renewal: Unit 1 Reactor Vessel, Vessel Support, and Bioshield Concrete Exposure Data" (ML21215A320) and Westinghouse LTR-REA-21-2-NP, Revision 1, "St. Lucie Units 1 & 2 Subsequent License Renewal: Unit 2 Reactor Vessel, Vessel Support, and Bio shield Concrete Exposure Data" (Attachments 1 and 2, respectively, of Enclosure 4 of the SLRA). RPV beltline and extended beltline fast neutron fluences (E > 1 MeV) at the end of 80 years of operation were calculated for each unit, as documented in WCAP-18609-NP, Revision 2, "St. Lucie Units 1 & 2 Subsequent License Renewal: Time-Limited Aging Analyses on Reactor Vessel Integrity" (Attachment 4 of Enclosure 4 of the SLRA).

The analysis methodologies used to calculate the Unit 1 and Unit 2 RPV neutron fluences are those described in the non-public topical reports, WCAP-18124-NP-A, Revision 0, "Fluence Determination with RAPTOR-M3G and FERRET" (ML18204A010), and WCAP-18124-P-A, Revision 0, Supplement 1-P, "Fluence Determination with RAPTOR-M3G and FERRET – Supplement for Extended Beltline Materials" (ML22153A139). The staff notes that its guidance set forth in Regulatory Guide (RG) 1.190, “Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence” (ML010890301), describes an acceptable fluence analysis methodology, and the staff previously approved for use the methodology in WCAP-18124-NP-A, Revision 0, and WCAP-18124-P-A Revision 0, Supplement 1-P. Because the applicant performed its neutron fluence calculations using NRC-approved methods that adhere to RG 1.190, the NRC staff determined that the neutron fluence projections using this methodology are acceptable.

The staff noted that the applicant’s projected neutron fluence values in LTR-REA-21-1-NP, Revision 1, and summarized in SLRA tables 4.2.1-1 and 4.2.1-1, are for 72 effective full-power years (EFPY) based on the assumption of a 95-percent capacity factor for the 20-year subsequent period of extended operation. The staff finds this assumption acceptable because plants generally do not achieve a 95-percent capacity factor, which means that this assumed 72-EFPY neutron fluence period will likely overestimate the actual neutron fluence that would be expected at the end of the subsequent period of extended operation. The staff notes that the capacity factor that plants may achieve could be higher for a single cycle, but based on historical operating data, this is highly unlikely for the average of many operating cycles to exceed a 95-percent capacity factor.

The staff noted that additional analysis for extrapolating RPV beltline fluence estimates to ex-vessel critical components is provided in NEESL00008-Rept-098, Revision 0, “St. Lucie Units 1 and 2 Subsequent License Renewal Primary Shield Wall Irradiation Evaluation” and LTR-SDA-21-021-P, Revision 2, “St. Lucie Units 1 & 2 Subsequent License Renewal: Reactor Pressure Vessel Supports Assessment” (Attachment 1 of Enclosure 5 of the SLRA).

SRP-SLR section 4.2.2.1.1.3 states that in the Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report AMP X.M2, “Neutron Fluence Monitoring,” the NRC staff has evaluated an AMP for projecting and monitoring neutron fluence for the subsequent period of extended operation. It also states that the staff has determined that this program is acceptable to project and monitor neutron fluence as a basis for managing loss of fracture toughness due to neutron irradiation embrittlement of RPVs in accordance with 10 CFR 54.21(c)(1)(iii). The staff notes that GALL-SLR Report AMP X.M2 states that this AMP is used in conjunction with GALL-SLR Report AMP XI.M31, “Reactor Vessel Material Surveillance.” The NRC staff’s evaluation of the Reactor Vessel Material Surveillance AMP is documented in SE section 3.0.3.2.19, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects. Because the staff determined that the applicant will monitor the neutron fluence of the RPV beltline and extended beltline components in accordance with its neutron fluence monitoring AMP, which the staff found to be consistent with GALL-SLR Report AMP X.M2 (as documented in SE section 3.0.3.2.2), the staff finds that the applicant’s Neutron Fluence Projections TLAA is consistent with the acceptance criteria in SRP-SLR section 4.2.2.1.1.3 and is therefore acceptable in accordance with 10 CFR 54.21(c)(1)(iii).

Therefore, the NRC staff finds that the applicant has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of aging due to neutron fluence on the intended functions of the RPV beltline and extended beltline materials will be adequately managed for the subsequent period of extended operation for St. Lucie Units 1 and 2.

4.2.1.3 UFSAR Supplement

SLRA appendix A1, “Unit 1 Updated Final Safety Analysis Report Supplement,” Revision 0, section 19.3.1.2, provides the UFSAR supplement summarizing the Neutron Fluence

Projections TLAA for PSL Unit 1. SLRA appendix A2, “Unit 2 Updated Final Safety Analysis Report Supplement,” Revision 0, section 19.3.1.2, provides the UFSAR supplement summarizing the Neutron Fluence Projections TLAA for PSL Unit 2. The NRC staff reviewed SLRA appendices A1 and A2, section 19.3.1.2 (of each appendix), consistent with the review procedures in SRP-SLR section 4.2.3.2.

Based on its review, the NRC staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the TLAA on neutron fluence monitoring, as required by 10 CFR 54.21(d).

4.2.1.4 Conclusion

Based on its review, the NRC staff concludes that the applicant provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of aging due to neutron fluence on the intended functions of the RPV beltline and extended beltline materials will be adequately managed through the neutron fluence monitoring AMP and the reactor vessel material surveillance AMP for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the Neutron Fluence Projections TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.2.2 Pressurized Thermal Shock

4.2.2.1 Summary of Technical Information in the Application

SLRA section 4.2.2 describes the applicant’s TLAA for pressurized thermal shock (PTS). The applicant stated that all of the beltline reactor pressure vessel (RPV) materials for Units 1 and 2 are projected to remain below the RT_{PTS} screening criteria values of 270 °F for plates, forgings, and longitudinal welds, and 300 °F for circumferentially oriented welds.

The applicant dispositioned the TLAA for PTS of the RPV in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation.

4.2.2.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for PTS of the RPV and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR section 4.2.3.1.3.2 and the acceptance criteria in SRP-SLR section 4.2.2.1.3.2.

During its audit (as described in the audit report, ML22188A086) and review, the staff also assessed the material property values (e.g., initial RT_{NDT}, weight % Cu, weight % Ni) for the “beltline” materials in SLRA tables 4.2.2-1 and 4.2.2-2 to confirm (1) these values were consistent with the CLB or (2) revisions to the CLB values are justified and appropriate. Based on its review, the staff confirmed that the material property values for the “beltline” materials in SLRA tables 4.2.2-1 and 4.2.2-2 are consistent with the applicant’s CLB and therefore appropriate for use in determining RT_{PTS} values for the end of the subsequent period of extended operation. Additionally, based on this confirmation, the staff finds that appropriate margin values consistent with 10 CFR 50.61, were applied for each Unit 1 and 2 RPV “beltline” material for the purposes of addressing PTS.

During its audit (as described in the audit report, ML22188A086) and review, the staff assessed the material property values (e.g., initial RT_{NDT}, weight %Cu, weight %Ni) for the “extended beltline” materials in SLRA tables 4.2.2-1 and 4.2.2-2 to (1) confirm these values were consistent with the CLB, (2) confirm the revisions to the CLB values are justified and appropriate, or (3) determine if these values are justified and appropriate if the RPV materials were not previously addressed in the CLB. The staff noted that additional details regarding the material property values are provided in Westinghouse Report WCAP-18609-NP, Revision 2, “St. Lucie Units 1 & 2 Subsequent License Renewal: Time-Limited Aging Analyses on Reactor Vessel” (ML21285A112), which was submitted as Attachment 4 to Enclosure 4 of the SLRA. Based on its audit, with the exception of two Unit 1 RPV materials, the staff verified that the material information (e.g., initial RT_{NDT}, weight % Cu, weight % Ni) for the “extended beltline” materials for Units 1 and 2 contained in SLRA tables 4.2.2-1 and 4.2.2-2 were based on information from certified material test reports, fabrication records, and/or databases containing RPV material information for the specific material. Based on its review, the staff finds the material property values for the “extended beltline” materials in SLRA tables 4.2.2-1 and 4.2.2-2 are acceptable and appropriate for use in determining RT_{PTS} values for the end of the subsequent period of extended operation. Additionally, based on this verification, the staff finds that appropriate margin values, consistent with 10 CFR 50.61, were applied for each Unit 1 and 2 RPV “extended beltline” material for the purposes of addressing PTS.

For two Unit 1 RPV “extended beltline” materials (i.e., upper to intermediate shell girth weld seam 8-203 and upper shell axial weld seams 1-203 A, B, and C), the staff issued Request for Additional Information (RAI) 4.2-1 to obtain the necessary information related to the material property values for these materials because the applicant relied on data from another RPV (i.e., Heat #21935 from Diablo Canyon Unit 1 and Heat #21935/12008 from Diablo Canyon Unit 2). The staff noted that inherent characteristics of manufacturing the RPV such as, but not limited to, welding processes, procedures and qualifications, post-weld heat treatment activities, manufacturer/fabricator, and time of fabrication, can impact the unirradiated values for upper-shelf energy and RT_{NDT} for RPV materials from plant to plant.

As clarified by the applicant’s response to RAI 4.2-1 (ML22221A134), the staff finds the applicant’s basis for determining the material property values (e.g., initial RT_{NDT}, weight %Cu, weight %Ni) for the Unit 1 upper to intermediate shell girth weld seam 8-203 and Unit 1 upper shell axial weld seams 1-203 A, B, and C are reasonable because the RPVs identified in RAI 4.2-1 were fabricated by the same vendor to similar ode requirements during the same timeframe and included qualification welds that have identical stress relief heat treatment (1150 °F ± 25 °F for 40 hours, furnace cooled to 600 °F) as required by the American Society of Mechanical Engineers (ASME) Code for the pressure vessel, with matching heat number and flux type. Thus, the staff finds that for these two Unit 1 RPV materials, the material information contained in SLRA tables 4.2.2-1 and 4.2.2-2 is acceptable and appropriate for use in determining RT_{PTS} values for the end of the subsequent period of extended operation. Additionally, based on this verification, the staff finds that appropriate margin values, consistent with 10 CFR 50.61, were applied for these two Unit 1 RPV “extended beltline” materials for the purposes of addressing PTS. Therefore, RAI 4.2-1 is resolved with respect to PTS.

The staff noted that the applicant assessed relevant surveillance data to determine its credibility per the criteria in 10 CFR 50.61 and RG 1.99, Revision 2, and potential consideration as to its use when calculating RT_{PTS} values. Specifically, the applicant indicated that RT_{PTS} values for the following RPV materials in SLRA tables 4.2.2-1 and 4.2.2-2 were determined based on credible surveillance data (as defined in 10 CFR 50.61(c)(2)(i)):

- Unit 1
    - Lower shell plate (i.e., C-8-1, C-8-2, and C-8-3)
    - Intermediate to lower shell girth weld seam 9-203 (Heat #90136)
- Unit 2
    - Intermediate shell plate (i.e., M-605-1 and M-605-3)
    - Intermediate shell axial weld seam 101-124C repair (Heat #83637)
    - Lower shell axial welds seams 101-142 A, B, & C (Heat #83637)
    - Upper to intermediate shell girth weld seam 106-121 (Heat #83637)

The staff noted that WCAP-18609-NP, Revision 2, provides the applicant's assessment of surveillance data. The staff reviewed sections 4, "Surveillance Data," and 5, "Chemistry Factor," and appendix B, "St. Lucie Units 1 and 2 Surveillance Program Credibility Evaluation," to determine whether the applicant's use of its surveillance data is appropriate. Based on its review, the staff determined that the assessment of the plant-specific surveillance data was appropriate and consistent with 10 CFR 50.61 and RG 1.99, Revision 2. Furthermore, the staff finds that (1) the Unit 1 surveillance data for the lower shell plate C-8-2 and Heat #90136 weld materials and (2) the Unit 2 surveillance data for the intermediate shell plate M-605-1 and Heat #83637 weld materials are credible and applicable for use in the applicant's evaluation for PTS and RT_{PTS} values for the RPV materials identified above. The staff noted that SLRA section 4.2.2 and WCAP-18609-NP, Revision 2, identify the consideration of non-credible surveillance data from Beaver Valley Unit 1 for the lower shell axial weld seams 3-203 A, B, and C (Heat #305424). However, this surveillance data was not used in determining the limiting RT_{PTS} values discussed below. Since use of the non-credible surveillance data would have provided lower estimates of RT_{PTS}, the consideration of this data was not considered relevant to the staff's evaluation of PTS.

The applicant stated that the limiting RT_{PTS} value at 72 EFPY for each unit are as listed below:

- base metal or longitudinal weld materials:
    - 250.8 °F for Unit 1, which corresponds to lower shell axial weld seams 3-203 A, B, and C (Heat #305424)
    - 195.3 °F for Unit 2, which corresponds to intermediate shell plate M-605-1 with credible surveillance data
- circumferentially oriented weld materials:
    - 135.3 °F for Unit 1, which corresponds to the upper to intermediate shell girth weld seam 8-203 (Heat #21935)
    - 64.1 °F for Unit 2, which corresponds to the intermediate to lower shell girth weld seam 101-171 (Heat #'s 83637/3P7317)

Based on its review, as described above related to material property information and surveillance data, the staff also verified that the projected RT_{PTS} values were calculated in accordance with 10 CFR 50.61; as such, the staff finds that the limiting materials for PTS identified by the applicant for (1) base metal or longitudinal weld materials and (2) circumferentially oriented weld materials are appropriate and the associated RT_{PTS} values are less than the screening criteria specified in 10 CFR 50.61. The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for PTS of the RPV materials have been projected to the end of the subsequent period of extended operation. Additionally, the TLAA meets the acceptance criteria in SRP-SLR section 4.2.2.1.3.2 because the PTS analyses were reevaluated consistent with 10 CFR 50.61 when considering the neutron fluence values for 80 years (72 EFPY), and it was demonstrated that the PTS screening criteria were not exceeded.

4.2.2.3 UFSAR Supplement

SLRA appendix A1, section 19.3.2.2, and appendix A2, section 19.3.2.2, provide the UFSAR supplement summarizing the TLAA for PTS systems for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.2.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address PTS of the RPVs, as required by 10 CFR 54.21(d).

4.2.2.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for PTS of the RPV have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.2.3 Upper-Shelf Energy

4.2.3.1 Summary of Technical Information in the Application

SLRA section 4.2.3 describes the applicant’s TLAA for upper-shelf energy for the RPVs. 10 CFR 50, appendix G, states that RPV beltline materials must have Charpy upper-shelf energy (USE) of no less than 75 ft-lb initially and must maintain Charpy USE throughout the life of the vessel of no less than 50 ft-lb, unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation, that lower values of Charpy USE will provide margins of safety against fracture equivalent to those required by appendix G of Section XI of the ASME Code.

The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation.

4.2.3.2 Staff Evaluation

The staff reviewed the applicant's TLAA for USE of the RPVs and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR section 4.2.3.1.2.2 and the acceptance criteria in SRP-SLR section 4.2.2.1.2.2.

During its audit (as described in the audit report, ML22188A086) and review, the staff assessed the material property values (e.g., initial USE, weight % Cu, weight % Ni) for the "beltline" materials in SLRA tables 4.2.3-1 and 4.2.3-2 to confirm (1) these values were consistent with the CLB or (2) revisions to the CLB values are justified and appropriate. Based on its review, the staff confirmed that the material property values for the "beltline" materials in SLRA tables 4.2.3-1 and 4.2.3-2 are consistent with the applicant's CLB and therefore appropriate for use in determining USE values for the end of the subsequent period of extended operation.

During its audit (as described in the audit report, ML22188A086) and review, the staff also assessed the material property values (e.g., initial USE, weight % Cu, weight % Ni) for the "extended beltline" materials in SLRA tables 4.2.3-1 and 4.2.3-2 to (1) confirm these values were consistent with the CLB, (2) confirm revisions to the CLB values are justified and appropriate, or (3) determine if these values are justified and appropriate if the RPV materials were not previously addressed in the CLB. The staff noted that the additional details regarding the material property values are provided in WCAP-18609-NP, Revision 2. Based on its audit, with the exception of two Unit 1 RPV "extended beltline" materials, the staff verified that the material information (e.g., initial USE, weight % Cu, weight % Ni) for the "extended beltline" materials for Units 1 and 2 contained in SLRA tables 4.2.3-1 and 4.2.3-2 were based on information from certified material test reports, fabrication records, and/or databases containing RPV material information for the specific material. Based on its review, the staff finds the material property values for the "extended beltline" materials in SLRA tables 4.2.3-1 and 4.2.3-2 are acceptable and appropriate for use in determining USE values for the end of the subsequent period of extended operation, except for two Unit 1 RPV "extended beltline" materials, which are evaluated below.

For two Unit 1 RPV "extended beltline" materials (i.e., upper to intermediate shell girth weld seam 8-203 and upper shell axial weld seams 1-203 A, B, and C), the staff issued RAI 4.2-1 to obtain the necessary information related to the material property values for these materials since the applicant relied on data from another RPV (i.e., Heat #21935 from Diablo Canyon Unit 1 and Heat #21935/12008 from Diablo Canyon Unit 2). The staff noted that inherent characteristics of manufacturing the RPV such as, but not limited to, welding processes, procedures and qualifications, post-weld heat treatment activities, manufacturer/fabricator, and time of fabrication, can impact the unirradiated values for upper-shelf energy and RT_{NDT} for RPV materials from plant to plant.

As clarified by the applicant's response to RAI 4.2-1 (ML22221A134), the staff finds the applicant's basis for determining the material property values (e.g., initial USE, weight % Cu, weight % Ni) for the Unit 1 upper to intermediate shell girth weld seam 8-203 and Unit 1 upper shell axial weld seams 1-203 A, B, and C to be reasonable because the RPVs identified in RAI 4.2-1 were fabricated by the same vendor to similar Code requirements during the same timeframe and included qualification welds that have identical stress-relief heat treatment (1150 °F ± 25 °F for 40 hours, furnace cooled to 600 °F) as required by the ASME Code for the pressure vessel, with matching heat number and flux type. Thus, the staff finds that for these two Unit 1 RPV materials, the material information contained in SLRA tables 4.2.3-1 and 4.2.3-2 is acceptable and appropriate for use in determining upper-shelf energy values at the end of the subsequent period of extended operation. Therefore, RAI 4.2-1 is resolved with respect to upper-shelf energy.

The staff noted that the applicant assessed relevant surveillance data to determine its credibility per the criteria in RG 1.99, Revision 2, and potential consideration as to whether it is appropriate to use when calculating upper-shelf energy values. Specifically, the applicant indicated that upper-shelf energy values for the following RPV materials in SLRA tables 4.2.3-1 through 4.2.3-2 were determined based on surveillance data:

- Unit 1
    - Lower shell plate C-8-2
    - Intermediate to lower shell girth weld seam 9-203 (Heat # 90136)

- Unit 2
    - Intermediate shell plate M-605-1

The staff noted that WCAP-18609-NP, Revision 2, provides the applicant's assessment of surveillance data. The staff reviewed section 4, "Surveillance Data," and appendix B, "St. Lucie Units 1 and 2 Surveillance Program Credibility Evaluation," to determine whether the applicant's use of its surveillance data is appropriate. Based on its review, the staff determined that the assessment of the plant-specific surveillance data assessment was acceptable and consistent with RG 1.99, Revision 2. Furthermore, the staff finds that the (1) Unit 1 surveillance data for the lower shell plate C-8-2 and Heat #90136 materials and (2) Unit 2 surveillance data for the intermediate shell plate M-605-1 are credible and applicable for use in the applicant's evaluation for upper-shelf energy values for the RPV materials identified above.

The applicant stated that the limiting upper-shelf energy value at 72 EFPY for Units 1 and 2 is 54.8 ft-lb for the intermediate shell plate C-7-3, and 66.4 ft-lb for the lower shell plate M-4116-1, respectively. Based on its review, as described above related to the material property information and surveillance data, the staff also verified that the projected upper-shelf energy values, including those that took into consideration credible surveillance data, were calculated in accordance with RG 1.99, Revision 2; as such, the staff finds that the limiting materials for upper-shelf energy identified by the applicant are appropriate and the associated upper-shelf energy values are greater than the screening criterion of 50 ft-lb per appendix G of 10 CFR Part 50.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for upper-shelf energy of the RPV have been projected to the end of the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR section 4.2.2.1.2.2 because the upper-shelf energy analyses were reevaluated consistent with RG 1.99, Revision 2, when considering the neutron fluence values for 80 years (72-EFPY), and it was demonstrated that the requirement of 50 ft-lb per appendix G of 10 CFR Part 50 was met.

4.2.3.3 UFSAR Supplement

SLRA appendix A1, section 19.3.2.3, and appendix A2, section 19.3.2.3, provide the UFSAR supplement summarizing the TLAA for upper-shelf energy for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.2.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the TLAA for upper-shelf energy, as required by 10 CFR 54.21(d).

4.2.3.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the upper-shelf energy analyses for the RPV beltline and extended beltline materials for Unit 1 and Unit 2 have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.2.4 Adjusted Reference Temperature

4.2.4.1 Summary of Technical Information in the Application

SLRA section 4.2.4 describes the applicant's TLAA for adjusted reference temperature (ART) for the RPV. The ART is defined as: Initial RT_{NDT} + (ΔRT_{NDT}) + Margin, and the ART of the limiting beltline or extended beltline material is used to adjust the pressure-temperature (P-T) limit curves to account for irradiation effects.

The applicant dispositioned the TLAA for ART for the RPV in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation.

4.2.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the ART for the RPV and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) consistent with the review procedures in SRP-SLR section 4.7.3.1.2 and the acceptance criteria in SRP-SLR section 4.7.2.1.2.

During its audit (as described in the audit report, ML22188A086) and review, which are described in SE section 4.2.2.2, the staff confirmed that the material property values (e.g., initial RT_{NDT}, % Cu, % Ni) for the "beltline" materials in tables 4.2.4-3 through 4.2.4-6 are consistent with the applicant's CLB and are therefore appropriate for use in determining ART values at the 1/4 T and 3/4 T location through the end of the subsequent period of extended operation. Additionally, based on this confirmation, the staff finds that the appropriate margin values consistent with RG 1.99, Revision 2 were applied for each Unit 1 and 2 RPV "beltline" material for the purposes of addressing ART.

During its audit (as described in the audit report, ML22188A086) and review, which are described in SE section 4.2.2.2, the staff also verified that, with the exception of two Unit 1 RPV materials, the material information (e.g., initial RT_{NDT}, weight % Cu, weight % Ni) for the "extended beltline" materials for Units 1 and 2 contained in SLRA tables 4.2.4-3 through 4.2.4-7 were based on information from certified material test reports, fabrication records, and/or databases containing RPV material information for the specific material. Based on its review, the staff finds the material property values for the "extended beltline" materials in SLRA tables 4.2.4-3 through 4.2.4-7 are acceptable and appropriate for use in determining ART values at the 1/4 T and 3/4 T location, as appropriate, at the end of the subsequent period of extended operation. For the Unit 2 hot-leg nozzle materials, the staff finds the applicant conservatively considered the maximum surface neutron fluence when calculating ART values, rather than considering the attenuation of radiation embrittlement through the thickness of the material. Additionally, based on this verification, the staff finds that the appropriate margin values consistent with RG 1.99, Revision 2, were applied for each Unit 1 and 2 RPV "extended beltline" material for the purposes of addressing ART.

For two Unit 1 RPV "extended beltline" materials (i.e., upper to intermediate shell girth weld seam 8-203 and upper shell axial weld seams 1-203 A, B, and C), the staff issued RAI 4.2-1 to obtain the necessary information related to the material property values for these materials because the applicant relied on data from another RPV (i.e., Heat #21935 from Diablo Canyon Unit 1 and Heat #21935/12008 from Diablo Canyon Unit 2). The staff noted that inherent characteristics of manufacturing the RPV such as, but not limited to, welding processes, procedures and qualifications, post-weld heat treatment activities, manufacturer/fabricator, and time of fabrication, can impact the unirradiated values for upper-shelf energy and RT_{NDT} for RPV materials from plant to plant.

As clarified by the applicant's response to RAI 4.2-1 (ML22221A134), the staff finds the applicant's basis for determining the material property values (e.g., initial RT_{NDT}, weight % Cu, weight % Ni) for the Unit 1 upper to intermediate shell girth weld seam 8-203 and Unit 1 upper shell axial weld seams 1-203 A, B, and C is reasonable because the RPVs identified in RAI 4.2-1 were fabricated by the same vendor to similar Code requirements during the same timeframe and included qualification welds that have identical stress relief heat treatment (1150 °F ± 25 °F for 40 hours, furnace cooled to 600 °F) as required by the ASME Code for the pressure vessel, with matching heat number and flux type. Thus, the staff finds that for these two Unit 1 RPV materials, the material information contained in SLRA tables 4.2.4-3 through 4.2.4-6 are acceptable and appropriate for use in determining ART values at the 1/4 T and 3/4 T location, as appropriate, at the end of the subsequent period of extended operation. Additionally, based on this verification, the staff finds that the appropriate margin values consistent with RG 1.99, Revision 2, were applied for this two Unit 1 RPV "extended beltline" material for the purposes of addressing ART. Therefore, RAI 4.2-1 is resolved with respect to ART.

The staff noted that the applicant assessed relevant surveillance data to determine its credibility per the criteria in RG 1.99, Revision 2, and potential consideration as to whether it is appropriate to use when calculating ART values. Specifically, the applicant indicated that ART values for the following RPV vessel materials in SLRA tables 4.2.4-3 through 4.2.4-6 that were determined based on credible surveillance data:

- Unit 1
    - Lower shell plate (i.e., C-8-1, C-8-2, and C-8-3)
    - Intermediate to lower shell girth weld seam 9-203 (Heat #90136)

- Unit 2
    - Intermediate shell plate (i.e., M-605-1 and M-605-3)
    - Intermediate shell axial weld seam 101-124C repair (Heat #83637)
    - Lower shell axial welds seams 101-142 A, B, & C (Heat #83637)
    - Upper to intermediate shell girth weld seam 106-121 (Heat #83637)

The staff noted that WCAP-18609-NP, Revision 2, provides the applicant's assessment of surveillance data. The staff reviewed sections 4, "Surveillance Data," and 5, "Chemistry Factor," and appendix B, "St. Lucie Units 1 and 2 Surveillance Program Credibility Evaluation," to determine whether the applicant's use of its surveillance data is appropriate. Based on its review, the staff determined that the assessment of the plant-specific surveillance data assessment was appropriate and consistent with RG 1.99, Revision 2. Furthermore, the staff finds that (1) the Unit 1 surveillance data for the lower shell plate C-8-2 and Heat #90136 materials and (2) the Unit 2 surveillance data for the intermediate shell plate M-605-1 and Heat #83637 are credible and applicable for use in the applicant's evaluation for ART values for the RPV materials identified above.

The staff noted that SLRA section 4.2.2 (table 4.2.2-1) and WCAP-18609-NP, Revision 2, identifies the use of non-credible surveillance data from Beaver Valley Unit 1 for the lower shell axial weld seams 3-203 A, B, and C (Heat #305424). Additionally, the staff noted that the relevant surveillance data for Heat #305424 was used in determining the chemistry factor. Since the scatter of the ΔT30 versus fluence data about the best fit line exceeded the one standard deviation value of 28 °F for welds but fell within the two standard deviation scatter band of 56 °F, the applicant applied the full margin term in calculating the ART value. Based on its review, the staff finds that the applicant prudently applied the full margin term in calculating the ART value to compensate for the excessive surveillance data scatter. Considering this prudent approach, the staff finds that the measured shift for this sister-plant surveillance data can be used in calculating the chemistry factor for Heat #305424 and the associated calculation of ART.

The applicant stated that the limiting ART value at 72 EFPY for each unit are listed below:

- Lower shell axial weld, seams 3-203 A, B, and C (Heat #305424) for Unit 1
- Intermediate shell plate M-605-1 for Unit 2

Based on its review, the staff also verified that the projected ART values were calculated in accordance with RG 1.99, Revision 2, and as such, the staff agrees that the limiting ART values at 72 EFPY identified by the applicant in the SLRA are appropriate. The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for ART of the RPV has been projected to the end of the subsequent period of extended operation. Additionally, the TLAA meets the acceptance criteria in SRP-SLR section 4.7.2.1.2 because the ART analyses were reevaluated consistent with RG 1.99, Revision 2 when considering the neutron fluence values for 80 years (72 EFPY). The staff noted that ART of the limiting RPV material is used to adjust the beltline P-T limit curves to account for irradiation effects, which are evaluated in SE section 4.2.5.

4.2.4.3 UFSAR Supplement

SLRA appendix A1, section 19.3.2.4, and appendix A2, section 19.3.2.4, provide the UFSAR supplement summarizing the TLAA for ART for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.2.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the TLAA for ART, as required by 10 CFR 54.21(d).

4.2.4.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for ART have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.2.5 Pressure-Temperature Limits and Low Temperature Overpressure Protection Setpoints

4.2.5.1 Summary of Technical Information in the Application

SLRA section 4.2.5 describes the applicant’s TLAA for P-T limits and low temperature overpressure protection (LTOP) setpoints. 10 CFR Part 50, appendix G, requires that the RPV be maintained within established P-T limits, including heat up and cooldown operations. The P-T limits must account for the anticipated RPV fluence effect on fracture toughness. Each time the P-T limit curves are revised, the Unit 1 LTOP power-operated relief valve (PORV) lift setting and Unit 2 LTOP PORV and shutdown cooling relief valve lift settings must be reevaluated. Therefore, LTOP limits are considered part of the calculation of P-T curves.

The applicant dispositioned the TLAA for P-T limits and LTOP setpoints in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of irradiation embrittlement of the RPV will be adequately managed by the reactor vessel material surveillance AMP for the subsequent period of extended operation.

4.2.5.2 Staff Evaluation

The staff reviewed the applicant’s P-T and LTOP setpoints TLAA for the Units 1 and 2 RPVs and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR section 4.2.3.1.4.3 and the acceptance criteria in SRP-SLR section 4.2.2.1.4.3.

SRP-SLR section 4.2.2.1.4.3 specifies updated P-T limits for the subsequent period of extended operation must be established and completed using the applicable technical specification change process for updating the P-T limit curves prior to the plant’s entry into the subsequent period of extended operation. The 10 CFR 50.90 process for P-T limits located in the limited condition of operations (LCOs) or the Administrative Controls Process for P-T limits that are administratively amended through the Pressure-Temperature Limits Report (PTLR) process can be considered adequate AMPs or aging management activities within the scope of 10 CFR 54.21(c)(1)(iii), such that the P-T limits will be maintained through the subsequent period of extended operation.

The current P-T limits for Unit 1 are contained in Section 3.4.4.9 of the Unit 1 TS and were calculated based on the most limiting value of RT_{NDT} corresponding to the limiting material in the beltline region of the RPV for 54 EFPY. Furthermore, the current P-T limits for Unit 2 are contained in Section 3.4.4.9 of the Unit 2 TS and were calculated using the most limiting value of RT_{NDT} corresponding to the limiting material in the beltline region of the RPV for 55 EFPY. The staff noted that the LTOP setpoints are dependent on the established P-T limits; thus, they also are dependent on the increase in the brittle-to-ductile transition temperature that is a function of neutron fluence and have the same term of applicability as the P-T limits (i.e., 54 EFPY for Unit 1 and 55 EFPY for Unit 2). The applicant stated that the reactor vessel material surveillance AMP ensures that the P-T limits and LTOP setpoints will be updated and submitted to the NRC prior to exceeding the current terms of applicability in the TS. The staff noted that this program provides data on neutron embrittlement of the RPV materials and neutron fluence data, which are used to evaluate P-T limits and LTOP setpoints. Additionally, the staff noted that the reactor vessel material surveillance AMP, as described in SLRA section B.2.3.19, is used in conjunction with the proposed neutron fluence monitoring AMP that provides a means to ensure the validity of the neutron fluence analysis and related neutron fluence-based TLAAs (e.g., pressure-temperature limits and LTOP setpoints). The staff's review of the reactor vessel material surveillance AMP is provided in SE section 3.0.3.2.19, and the review of the neutron fluence monitoring AMP is provided in SE section 3.0.3.2.2.

As identified in SE section 4.1, there are two currently active 10 CFR 50.12 exemptions (one for each unit) that are related to the applicant's current P-T limits. Specifically, these exemptions requested the use of Topical Report Combustion Engineering (CE) NPSD-683-A, Revision 06, "Development of a RCS Pressure and Temperature Limits Report for the Removal of P-T Limits and LTOP Requirements from the TS," (ML011350387) to generate the current P-T limits in lieu of the requirements of 10 CFR Part 50, appendix G, section IV.A.2, "Pressure-Temperature Limits and Minimum Temperature Requirements."

In accordance with 10 CFR 50.12, these exemptions were approved by the NRC in letters dated December 6, 2011 (ML11297A096), and April 30, 2012 (ML12096A270), for Units 1 and 2, respectively. The staff noted that the use of these exemptions is associated with the current P-T limits for Units 1 and 2, which are applicable through 54 EFPY and 55 EFPY, respectively. Updated P-T limits and LTOP setpoints will be submitted by the applicant to the staff for review and approval in accordance with established regulatory processes (i.e., license amendment via 10 CFR 50.90 or administratively amended through the PTLR process) prior to exceeding the current terms of applicability in the TS for Units 1 and 2 (i.e., 54 EFPY and 55 EFPY, respectively) and the subject exemptions, if needed, will be resubmitted to the staff under the appropriate regulatory process.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of irradiation embrittlement on the RPVs will be adequately managed for the subsequent period of extended operation. Additionally, the TLAA meets the acceptance criteria in SRP-SLR section 4.2.2.1.4.3 because, as discussed above, updated P-T limits and LTOP setpoints will be updated and submitted to the staff for review and approval in accordance with established regulatory processes.

4.2.5.3 UFSAR Supplement

SLRA appendix A1, section 19.3.2.5, and appendix A2, section 19.3.2.5, provide the UFSAR supplement summarizing the P-T and LTOP setpoint TLAAs for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.2.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the P-T limit and LTOP setpoint TLAAs, as required by 10 CFR 54.21(d).

4.2.5.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of neutron irradiation on the intended functions of the Units 1 and 2 RPVs and the associated P-T limits and LTOP setpoints will be updated and submitted to the NRC prior to exceeding the current terms of applicability in the TS by the reactor vessel material surveillance AMP. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.3 Metal Fatigue

SLRA section 4.3 states that fatigue analyses are required on components designed to ASME Code, Section III, Class 1. Other codes require a fatigue analysis or assume a stated number of full-range thermal and displacement transient cycles, such as ASME Code, Section III, Class 2 and 3; USA Standard (USAS) B31.7 (currently known as American National Standards Institute or ANSI), “Nuclear Power Piping” Class 1; USAS (ANSI) B31.1, “Power Piping”; as allowed per USAS (ANSI) B31.7, Class 2 and 3; and ASME Code, Section VIII, “Rules for Construction of Pressure Vessels,” Division 2.

The following are those analyses that were identified as fatigue TLAAs or support a fatigue TLAA:

- “Metal Fatigue of Class 1 Components” (SLRA section 4.3.1)
- “Metal Fatigue of Non-Class 1 Components” (SLRA section 4.3.2)
- “Environmentally-Assisted Fatigue” (SLRA section 4.3.3)
- “High-Energy Line Break Analyses” (SLRA section 4.3.4)

4.3.1 Metal Fatigue of Class 1 Components

4.3.1.1 Summary of Technical Information in the Application

SLRA section 4.3.1, as supplemented by the letter on June 30, 2022 (ML22181A147), describes the applicant’s fatigue TLAAs on ASME Code, Section III, Class 1, and ANSI B31.7, Class 1 components. The fatigue analyses are based on explicit numbers and amplitudes of thermal and pressure transients described in the design specifications. The components evaluated in the fatigue analyses are the reactor vessels, control element drive mechanisms (CEDM) pressure boundary components, reactor coolant piping, steam generators, reactor coolant pumps, pressurizers, and reactor vessel internal (RVI) components. The fatigue analyses in the CLB demonstrate that the cumulative usage factors (CUFs) do not exceed the design limit of 1.0 based on the design transient cycles. The design transient cycles in the CLB are bounding for the 80-year projected transient cycles.

The applicant dispositioned the TLAAs in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of fatigue on the intended functions of the Class 1 components will be adequately managed by the fatigue monitoring program for the subsequent period of extended operation. The fatigue monitoring program will be used to ensure that the CUFs for the Class 1 components do not exceed the design limit of 1.0, as identified in SLRA section B.2.2.1.

4.3.1.2 Staff Evaluation

The staff reviewed the applicant's fatigue TLAAs for ASME Code, Section III, Class 1, and ANSI B31.7, Class 1 components, and the corresponding disposition of the TLAAs in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR section 4.3.3.1.1.3 and the acceptance criteria in SRP-SLR section 4.3.2.1.1.3.

In relation to the Class 1 fatigue analyses, SLRA section 4.3.1 describes the 80-year cycle projections for design transients. SLRA section 4.3.1 also indicates that the 80-year projections of the transient cycles use the cumulative cycle counts for each transient monitored on each unit up to December 31, 2019. The staff noted that the applicant used the more conservative cycles from the following projection approaches: (1) cycle projections based on a direct extrapolation of cycle counts since the start of operation to the end of the subsequent period of extended operation and (2) cycle projections based on cycle accumulation over the recent 10 years of cycle counts and then pro-rating the counts for the remaining years to the end of the subsequent period of operation.

The staff found that the cycle projections are reasonable because the applicant used the actual cycle accumulation data, consistent with the guidance in SRP-SLR section 4.3.2.1.1, and the 80-year projected cycles are bounded by the CLB transient cycles. The applicant also selected conservative cycles between the projections (1) based on the cycle counts since the start of the operation and (2) based on the recent 10 years of cycle counts. However, the staff found a need to further evaluate specific aspects of transient cycle projections as described below.

SLRA tables 4.3.1-1 and 4.3.1-2 describe the design transients for St. Lucie Units 1 and 2, respectively, which are included in the original license renewal application (60-year operation). In its response to RAI 4.3.1-1 dated June 30, 2022 (ML22181A147), the applicant explained why some of the design transient cycles listed in these tables do not need to be monitored for the CUF analysis.

The staff finds the RAI response acceptable, except for the item further evaluated below, because the applicant provided adequate justification for the transients that are not monitored for the CUF analysis as follows: (1) the design cycle number of the transient is significantly greater than the 80-year projected cycles, so fatigue monitoring is not needed due to a large cycle margin (e.g., operating earthquake events); (2) the design transient has an insignificant effect on the CUF (contribution to CUF is less than 0.1) such that fatigue monitoring is not needed; or (3) the design transient is a faulted condition transient that does not require a CUF analysis (e.g., “high pressure safety injection” and “safe shutdown earthquake” transients).

In the response to RAI 4.3.1-1, the applicant also indicated that cycle counting is not performed on some of St. Lucie Unit 1 design transients (e.g., “cold feed following hot standby” transient) based on low contributions of transients to component CUF. Specifically, the applicant explained that cycle counting is not performed on the transients in accordance with the following criteria that are consistent with the CLB: (1) the component CUF associated with a transient is not greater than 0.1 or (2) if the component CUF is greater than 0.1, the contribution of a transient to CUF is not greater than 0.1.

In addition, the staff noted that a summary of the screening of the CUF evaluation results for St. Lucie Unit 1 describes the transients that contribute more than 0.1 to the component CUF, which are called limiting transients by the applicant. The total contribution of non-limiting transients to CUF may be greater than 0.1 for the following components of St. Lucie Unit 1: (1) steam generator primary head at divider seat bar, (2) pressurizer bottom head support skirt, (3) surge line resistance temperature detector nozzle, and (4) surge line sample nozzle. Based on the discussion above, the staff noted that these components may be subject to the combined effect of multiple uncounted transients.

Therefore, the staff found a need to clarify whether these components are subject to multiple uncounted transients that could result in ineffective fatigue monitoring. In its response to RAI 4.3.1-1a dated October 26, 2022 (ML22299A037), the applicant explained why these components do not have a concern about the combined effect of multiple uncounted transients that could cause ineffective fatigue monitoring.

The staff finds the RAI response acceptable because the applicant identified the counted and uncounted transients associated with these components and provided the following: (1) the applicant will count the "plant loading/unloading" and "10 [percent] step load increase/decrease" transients, which are associated with the components, for the subsequent period of extended operation (Enhancement 2 of the fatigue monitoring program in SLRA section B.2.2.1); and (2) the overall contribution of uncounted transients to CUF is less than 0.1 for each of the components.

In its response dated June 30, 2022 (ML22181A147) to RAI 4.3.1-2, the applicant also explained why the bolt-up transient for reactor vessel closure head (RVCH) studs does not need fatigue monitoring. The staff finds the RAI response acceptable because the applicant explained that the effect of the bolt-up transient on the fatigue of RVCH studs is insignificant (contribution to CUF less than 0.1). The staff also noted that the CUF values for RVCH studs based on eighty-year projected cycles are less than 0.56 with a large margin to the design limit of 1.0.

In addition to the transients listed in SLRA tables 4.3.1-1 and 4.3.1-2, the applicant listed additional transients, which are monitored by the fatigue monitoring program, in SLRA tables 4.3.1-3 and 4.3.1-4 for St. Lucie Units 1 and 2, respectively. SLRA table 4.3.1-4 provides the CUF information on the pressurizer spray nozzle of St. Lucie Unit 2. However, the SLRA does not provide information on transients and cycles for the pressurizer spray nozzle. In its response to RAI 4.3.1-3 dated June 30, 2022 (ML22181A147), the applicant provided additional information on the relevant transients and their cycle limits regarding the CUF analysis for the pressurizer spray nozzle of St. Lucie Unit 2.

The staff finds that the RAI response is acceptable because (1) the applicant described the relevant transients, their accumulated cycles and allowable 80-year cycles for the CUF analysis of the pressurizer spray nozzle in a manner consistent with the cycle information for the other transients listed in SLRA tables 4.3.1-3 and 4.3.1-4, and (2) the applicant clarified that the these transients are monitored by the fatigue monitoring program to ensure that the CUF of the pressurizer spray nozzle does not exceed the design limit (1.0).

The staff also noted that SLRA tables 4.3.1-5 and 4.3.1-6 describe detailed information on 80-year cycle projections for additional transients (e.g., "loss of letdown flow" transient cycles) for St. Lucie Units 1 and 2, respectively, that were not included in the fatigue evaluations of the original license renewal application. In its response to RAI 4.3.1-3 dated June 30, 2022 (ML22181A147), the applicant also clarified the fatigue monitoring activities for the following transients: (1) "loss of charging" transient, (2) "loss of letdown" transient, (3) "loss of regenerative heat exchanger (short-term)" transient; and (4) "loss of regenerative heat exchanger (long-term)" transient.

The staff finds the RAI response acceptable because (1) the applicant confirmed that these four transients will be monitored by the fatigue monitoring program to ensure that the actual cycles do not exceed the design cycles and (2) the cycle monitoring activities are adequately identified in Enhancement 2 of the fatigue monitoring program, as revised in the RAI response (SE section 3.0.3.2.1).

The applicant further addressed the fatigue TLAAs for the following ASME Code, Section III, Class 1, and ANSI B31.7, Class 1 components: (1) reactor vessels, (2) CEDM pressure boundary components, (3) reactor coolant piping, (4) steam generators, (5) reactor coolant pumps, (6) pressurizers, and (7) RVI components.

The applicant indicated that these components were originally designed in accordance with the requirements for ASME Code, Section III, Class 1 components, or ANSI B31.7, Class 1 components. The CLB fatigue analyses for these components are based on explicit numbers and amplitudes of thermal and pressure transients described in the design specifications. The applicant also explained that the CUFs for these components, which are based on the CLB design transient cycles, meet the design limit (i.e., not exceeding 1.0).

The staff noted that the extended power uprate project for St. Lucie Units 1 and 2, implemented in 2012, also included the fatigue evaluation for the Class 1 components (ML12181A019 and ML12235A463). The applicant determined that all the existing CUF values meet the design limit of 1.0, as approved by the staff.

In addition, the staff noted that the applicant projected the design transient cycles for 80 years of operation, as discussed in SLRA section 4.3.1. The staff finds that the projected 80-year cycles are bounded by the design cycles (equivalent to 60-year CLB cycles), as described in SLRA tables 4.3.1-1 through 4.3.1-6. Based on the design cycles bounding for the 80-year projected cycles, the staff finds that there is reasonable assurance in the applicant's determination that the CUF values can continue to meet the design limit of 1.0 for the subsequent period of extended operation.

Based on its review, the staff finds that the fatigue TLAAs for the ASME Code, Section III, Class 1 and ANSI B31.7, Class 1 components are acceptable because (1) the 80-year projected transient cycles are less than the design cycles, which provides reasonable assurance that the CUF values will not exceed the design limit of 1.0, consistent with the CLB fatigue analysis, and (2) the fatigue monitoring program will monitor the actual transient cycles to ensure that the CUF values do not exceed the design limit of 1.0 by performing corrective action as needed (e.g., repair/replacement of components and refinement of fatigue analysis).

For the ASME Code, Section III, Class 1, and ANSI B31.7, Class 1 components, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the components will be adequately managed for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR section 4.3.2.1.1.3 because the applicant proposed to use the fatigue monitoring program for managing the effects of fatigue. As previously noted, the staff's evaluation of the fatigue monitoring program is documented in SE section 3.0.3.2.1.

4.3.1.3 UFSAR Supplement

SLRA appendix A1, section 19.3.3.1, and appendix A2, section 19.3.3.1, provide the UFSAR supplement summarizing the metal fatigue analysis of the Class 1 components for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.3.3.2.

Based on its review of the UFSAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR section 4.3.2.2, and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the metal fatigue TLAAs for ASME Code, Section III, Class 1, and ANSI B31.7, Class 1 components, as required by 10 CFR 54.21(d).

4.3.1.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of ASME Code, Section III, Class 1, and ANSI B31.7, Class 1 components will be adequately managed by the fatigue monitoring program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.3.2 Metal Fatigue of Non-Class 1 Components

4.3.2.1 Summary of Technical Information in the Application

SLRA section 4.3.2, as supplemented by letter dated June 13, 2022 (ML22164A802), describes the applicant's TLAA on metal fatigue of non-Class 1 piping systems. The piping systems are not required to have an explicit analysis of cumulative fatigue usage, but cyclic loading is considered in a simplified manner in the design process. The transient cycle estimates in SLRA Table 4.3.2-2 indicate that, except for the reactor coolant system (RCS) sample lines, the non-Class 1 piping systems will not exceed 7,000 temperature cycles for 80 years of operation, which means that no stress reduction factor is required in the stress analysis. For the RCS sample lines, a stress reduction factor of 0.7 is applied in the piping stress analysis based on the number of temperature cycles for 80 years.

The applicant dispositioned the TLAA on the metal fatigue of the RCS sample lines in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation. The applicant also dispositioned the TLAA on the metal fatigue of the other non-Class 1 piping systems in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analysis remains valid for the subsequent period of extended operation.

4.3.2.2 Staff Evaluation

The staff reviewed the applicant's fatigue TLAA for the RCS sample lines and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR section 4.3.3.1.1.2 and the acceptance criteria in SRP-SLR section 4.3.2.1.1.2. The staff also reviewed the applicant's fatigue TLAA for the other non-Class 1 piping systems and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR section 4.3.3.1.1.1 and the acceptance criteria in SRP-SLR section 4.3.2.1.1.1.

The applicant explained that the transient cycle qualification for the non-Class 1 piping systems is performed in accordance with the provisions of the ANSI B31.1 code, the ANSI B31.7 code or the ASME Code, Section III (Class 2 and 3). The non-Class 1 piping systems are not required to have an explicit fatigue analysis that involves calculations of CUF values. Instead, implicit fatigue analyses are performed based on the number of equivalent full temperature cycles and corresponding stress range reduction factors. If the total number of temperature cycles is 7,000 or fewer, a stress range reduction factor of 1.0 is applied to the allowable stress range, which means the allowable stress does not need to be reduced due to the effects of cyclic loading. If the total number of temperature cycles is greater than 7,000, a stress range reduction factor less than 1.0 is applied to the allowable stress range depending on the number of full temperature cycles, as described in SLRA table 4.3.2-1.

In addition, SLRA table 4.3.3-2 describes the 80-year cycle estimates for each of the non-Class 1 piping systems. In the cycle estimation, the applicant used the piping system design information, plant operation procedures, test requirements, UFSAR information, and specific system-level knowledge. For example, the RCS sample line, which experiences a daily thermal cycle, is estimated to have a total of 29,200 cycles for 80 years of operation (80 x 365 cycles). The applicant also explained that the steam-driven auxiliary feedwater pumps are tested once per month in accordance with plant operating procedures, and therefore the 80-year cycle estimate for the auxiliary feedwater system is 960 cycles (12 x 80 cycles). For the safety injection system, the applicant stated that the thermal and loading cycles of the system are consistent with the heat up and cooldown cycles that have a cycle limit of 500, which is significantly below 7,000 cycles that correspond to a stress range reduction factor of 1.0 with no reduction.

The staff finds that the 80-year cycle estimates are acceptable because the applicant used the relevant information in the 80-year cycle estimation for the non-Class 1 piping systems and calculated the 80-year cycles by using transient cycles per unit time period (e.g., daily and yearly cycles) and design cycle limits based on piping design information, operation procedures, test requirements, UFSAR information, and specific system-level knowledge.

The staff also noted that, except for the RCS sample lines, the non-Class 1 piping systems are estimated to have thermal cycles less than 7,000 cycles, as provided in SLRA table 4.3.2-1. Therefore, these piping systems use a stress range reduction factor of 1.0,.i.e., no reduction. For the sample lines, which involve 29,200 cycles for 80 years of operation, the applicant identified a stress range reduction factor of 0.7 because the number of cycles corresponds to the thermal cycle range between 22,000 and 45,000.

The applicant further provided the stress analysis results for the RCS sample lines with the stress range reduction factor in its response, dated June 13, 2022 (ML22164A802), to RAI 4.3.2-1, demonstrating that the maximum stress levels for the RCS sample lines are less than the allowable stress levels in all cases. The staff finds the response acceptable because the applicant's analysis, in accordance with ASME Code, Section III, NC-3652.3, demonstrates that the maximum stress for each sample line is less than the allowable stress that is adjusted by the stress range reduction factor (0.7) for the subsequent period of extended operation.

The staff also noted that the implicit fatigue analyses for the non-Class 1 piping systems, which involve the stress range reduction factor less than 1.0, may have a potential impact on the high-energy line break (HELB) location postulation. The staff's evaluation of the HELB location postulation is documented in section 4.3.4 of this SE (only applicable to St. Lucie Unit 2).

The staff finds that the metal fatigue TLAA for the RCS sample lines is acceptable because the analysis considered an adequate stress reduction factor of 0.7 based on the 80-year cycles of the piping lines. The staff also finds that the metal fatigue TLAA for the other non-Class 1 piping systems is acceptable because the equivalent full temperature cycles are fewer than 7,000 cycles, and, therefore, there is no need to apply a stress range reduction factor of less than 1.0 on the allowable stress, consistent with the CLB.

As discussed above, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the fatigue analysis for the RCS samples line has been projected to the end of the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR section 4.3.2.1.1.2 because the applicant demonstrated that the maximum stress for each sample line is less than the allowable stress adjusted by the appropriate stress range reduction factor.

The staff also finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the fatigue analysis for the non-Class 1 piping systems other than the RCS samples line remains valid for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR section 4.3.2.1.1.1 because the applicant demonstrated that the existing fatigue analysis remains valid for the subsequent period of extended operation.

4.3.2.3 UFSAR Supplement

SLRA appendix A1, section 19.3.3.2, and appendix A2, section 19.3.3.2, provide the UFSAR supplement summarizing the fatigue analysis of the non-Class 1 piping systems for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.3.3.2.

Based on its review of the UFSAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR section 4.3.2.2 and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the fatigue TLAA for the non-Class 1 piping systems, as required by 10 CFR 54.21(d).

4.3.2.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the fatigue analysis for the RCS sample lines has been projected to the end of the subsequent period of extended operation. The staff also concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the fatigue analysis for the other non-Class 1 piping systems remains valid for the subsequent period of extended operation. In addition, the staff concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.3.3 Environmentally Assisted Fatigue

4.3.3.1 Summary of Technical Information in the Application

SLRA section 4.3.3, as supplemented by letters dated June 13, 2022 (ML22164A802), and June 30, 2022 (ML22181A147), describes the applicant's TLAA on the environmentally-assisted fatigue (EAF) of reactor coolant pressure boundary (RCPB) piping and components, including the ASME Code Section III, Class 1 and ANSI B31.7, Class 1 locations. The EAF analysis considers the leading EAF locations described in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components" and additional plant-specific locations that could be more limiting than the NUREG/CR-6260 locations. In the analysis, the environmental cumulative usage factor (CUF_{en}) value is calculated by applying the environmental fatigue correction factor (F_{en}) for the component material in accordance with NUREG/CR-6909, Revision 1, "Effect of LWR Water Environments on the Fatigue Life of Reactor Materials."

The applicant dispositioned the EAF TLAA in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of EAF on the intended functions of the components and piping will be adequately managed for the subsequent period of extended operation by the fatigue monitoring AMP (SLRA section B.2.2.1) and pressurizer surge line AMP (SLRA sectionB.2.3.44).

4.3.3.2 Staff Evaluation

The staff reviewed the EAF TLAA and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR section4.3.3.1.2.3 and the acceptance criteria in SRP-SLR section 4.3.2.1.2.3.

As described in SLRA section 4.3.3, the applicant performed an EAF analysis on the following RCPB components: (1) reactor vessels, including the replacement closure heads, (2) CEDMs, (3) pressurizers, (4) reactor coolant pumps, and (5) steam generators (primary side). The applicant also performed an EAF analysis on the reactor coolant main loop piping and auxiliary piping systems such as pressurizer surge piping, pressurizer spray piping, pressurizer safety and relief valve piping, reactor coolant system letdown and drain piping, charging piping, safety injection piping, and shutdown cooling piping.

The staff noted that the following NUREG/CR-6260 locations are applicable to the St. Lucie plant: (1) reactor vessel shell and lower head, (2) reactor vessel inlet and outlet nozzles, (3) pressurizer surge line, (4) charging system nozzle, (5) safety injection system nozzle, and (6) shutdown cooling line.

For the pressurizer surge line, the applicant explained that a flaw tolerance analysis was performed in accordance with ASME Code, Section XI, Appendix L, and the aging effect of EAF for the piping line will be managed by using the pressurizer surge line AMP, which includes periodic inspections, in conjunction with the Appendix L flaw tolerance analysis. The staff's evaluation of the pressurizer surge line AMP is documented in section 3.0.3.3.1 of this SE.

The staff finds that the applicant adequately included the NUREG/CR-6260 locations in the evaluation of EAF, consistent with the guidance in SRP-SLR 4.3.2.1.2, by performing 80-year environmental cumulative usage factor (CUF_{en}) calculations for the NUREG/CR-6260 locations other than the pressurizer surge line and by performing a flaw tolerance analysis for the pressurizer surge line in accordance with ASME Code, Section XI, Appendix L. The staff also finds that the 80-year CUF_{en} calculations for the NUREG/CR-6260 locations were performed in accordance with NUREG-6909, Revision 1, consistent with the guidance in SRP-SLR section 4.3.2.1.2.

The applicant also performed an EAF screening evaluation to identify additional plant-specific locations that may be more limiting than the NUREG/CR-6260 locations in terms of CUF_{en}. The screening process evaluates the Class 1 component and piping locations, including the NUREG/CR-6260 locations. Attachment 6 to Enclosure 4 of the SLRA describes the leading locations for EAF, which are also called sentinel locations, based on the EAF screening evaluation.

In its response to RAI 4.3.3-1 dated June 13, 2022 (ML22164A802), the applicant provided additional information on the screening evaluation of the EAF analysis. The RAI response clarified the following: (1) the screening process organizes the component and piping locations into transient sections (also called thermal zones), which are defined as groups of locations that experience the same transients; (2) the screening process compares the locations within each transient section to identify the leading EAF locations; (3) the screening process considers each material (e.g., carbon steel, stainless steel, and nickel alloy) in the calculation of the screening CUF_{en} for each location; (4) the screening CUF_{en} values are calculated in accordance with the guidance of NUREG-6909, Revision 1, consistent with the guidance in SRP-SLR 4.3.2.1.2; and (5) the calculated screening CUF_{en} values were conservatively estimated (e.g., using the bounding strain rate and oxygen content of reactor coolant). The staff finds the RAI response acceptable because the applicant took an effective approach to identify the leading EAF locations.

The applicant also performed the more detailed EAF analysis in accordance with NUREG/CR-6909, Revision 1, consistent with the guidance in SRP-SLR section 4.3.2.1.2. In the detailed EAF analysis, the applicant conservatively determined the environmental fatigue correction factor (F_{en}) and CUF_{en} values based on bounding values for temperature, strain rate, dissolved oxygen content of reactor coolant chemistry, and sulfur content of low-alloy and carbon steels. The applicant further explained that, in some cases, the conservatism associated with CUF_{en} calculations is reduced by using the modified rate approach described in section 4.4 of NUREG/CR-6909, Revision 1, which uses the realistic strain rates of transients as a function of operating temperature.

The staff finds the overall approach of the detailed EAF analysis is reasonable because (1) the detailed analysis uses the guidance in NUREG/CR-6909, Revision 1, consistent with the guidance in SRP-SLR section 4.3.2.1.2, and (2) the conservatism associated with CUF_{en} calculations is reduced based on the more realistic strain rates of transients. The other aspects of the EAF analysis are further evaluated below.

The staff noted that the EAF analyses for St. Lucie Unit 2 replacement steam generators, Unit 1 and 2 replacement reactor vessel closure heads, Unit 2 pressurizer repairs, Unit 2 weld overlays, and Unit 2 auxiliary spray line reducer are provided in Attachment 4 of Enclosure 5 of the SLRA (Framatome Document Number 86-9329644-001, “St. Lucie SLR CUF_{en} Evaluations Summary”) (Framatome report).

Table 5-2 of the Framatome report specifies the reduced (more limiting) cycles of transients that are used in CUF_{en} calculations, as reduced from the design cycles. The staff also noted that some of these transients that involve reduced cycles compared to design cycles will not be monitored in the fatigue monitoring AMP, as indicated in SLRA section 4.3.1. Specifically, the transients, which are used for the CUF_{en} calculations in the Framatome report and will not be monitored in the fatigue monitoring AMP (SLRA section B.2.2.1), are the following: (1) "plant loading/unloading" transient; (2) "10 percent step load increase/decrease" transient; and (3) "cold feedwater following hot standby" transient.

The staff further noted that the reduced cycles of the "primary coolant pump starting/stopping" transient are used in the EAF analysis for the Unit 2 steam generator tube-to-tubesheet weld. However, SLRA section 4.3.1 and the Framatome report do not clearly address whether the pump transient of St. Lucie Unit 2 will be monitored in the fatigue monitoring AMP. Therefore, the staff issued RAI 4.3.3-2 and the applicant provided additional information related to the monitoring of the pump transient.

In its response to RAI 4.3.3-2 dated June 30, 2022 (ML22181A147), the applicant described the revised monitoring activities of the fatigue monitoring AMP for the transients that are used in the EAF analysis, as reduced from the design cycles, for 80 years of operation. The staff finds the RAI response regarding the reduced transient cycles acceptable because the applicant confirmed the following: (1) the fatigue monitoring AMP will monitor the "plant loading/unloading" and "10 percent step load increase/decrease" transients of St. Lucie Units 1 and 2, (2) the fatigue monitoring AMP will also monitor the "cold feedwater following hot standby" and "primary coolant pump starting/stopping" transients of St. Lucie Unit 2, which are unique to the EAF analysis for the Unit 2 replacement steam generators; and (3) the cycle monitoring activities for the subsequent period of extended operation will ensure that the actual cycles do not exceed the reduced cycles used in the EAF analyses (Enhancement 2 of the fatigue monitoring AMP).

In addition, tables 5-2 and 5-3 of the Framatome report address the transients for the St. Lucie Unit 2 pressurizer spray nozzle. However, the Framatome report does not clearly address whether the following transients related to Unit 2 pressurizers, which involve reduced cycles in the CUF_{en} calculations, will be monitored in the fatigue monitoring AMP: (1) "spray nozzle" transient (also called the spray nozzle transient 17A/B/C), (2) "main spray initiation" transient, (3) "auxiliary spray at power 1" and "auxiliary spray at power 2" transients, and (4) "main spray term in cooldown" transient.

In its response to RAI 4.3.3-2 dated June 30, 2022 (ML22181A147), as supplemented by letter dated September 22, 2022 (ML22265A134), the applicant clarified the fatigue monitoring for the transients, which involves reduced cycles in the CUF_{en} calculations discussed above for 80 years of operation. The staff finds the RAI response regarding the St. Lucie Unit 2 transients acceptable because the applicant confirmed the following: (1) the fatigue monitoring AMP will monitor the "spray nozzle," "main spray initiation," "auxiliary spray at power 1," "auxiliary spray at power 2," and "main spray term in cooldown" transients of St. Lucie Unit 2 for the subsequent period of extended operation; and (2) the cycle monitoring activities for the subsequent period of extended operation will ensure that the actual cycles of these transients do not exceed the cycles that are used in the EAF analyses.

With respect to the aging management for EAF, the applicant indicated that the effects of fatigue on the intended functions of RCPB components and piping other than the pressurizer surge line will be managed by the fatigue monitoring AMP (SE section 3.0.3.2.1). In addition, the effects of EAF on the intended functions of the pressurizer surge line will be managed by the pressurizer surge line AMP (SE section 3.0.3.3.1).

The staff noted that the fatigue monitoring AMP monitors the actual transient cycles to ensure that the actual cycles do not exceed the transient cycles, which are used as the inputs to the EAF analysis, such that the CUF_{en} values will not exceed the design limit of 1.0 (SE section 3.0.3.2.1). The staff finds that the applicant's use of the fatigue monitoring AMP is adequate to manage the effects of EAF because the program monitors the transient cycles to ensure that the CUF_{en} values meet the design limit (1.0), consistent with the guidance in GALL-SLR AMP X.M1 "Fatigue Monitoring" and SRP-SLR section 4.3.2.1.2.3. The staff's evaluation of the fatigue monitoring AMP is provided in SE section 3.0.3.2.1.

The applicant also proposed the use of the pressurizer surge line AMP that performs periodic inspections on the pressurizer surge line, which is evaluated in accordance with the provisions of ASME Code, Section XI, Appendix L for flaw tolerance. As described in SLRA table B-9, the flaw tolerance evaluations postulate crack initiation and growth. The evaluations confirm that the 10-year fatigue crack depths growing from postulated initial cracks do not exceed the maximum allowable crack depths in the pressurizer surge line. The staff finds that the applicant's use of the pressurizer surge line AMP is adequate to manage the effects of EAF because the program performs periodic inspections to ensure that the flaw tolerance analysis remains valid, and the structural integrity of the pressurizer surge line is maintained. The staff's evaluation of the pressurizer surge line AMP is provided in SE section 3.0.3.3.1.

For the RCPB and piping, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of EAF on the intended functions of the components and piping will be adequately managed for the subsequent period of extended operation. Additionally, the TLAA meets the acceptance criteria in SRP-SLR section 4.3.2.1.2.3 because the applicant proposed to use the fatigue monitoring AMP and the pressurizer surge line AMP, in conjunction with the flaw tolerance evaluation per ASME Code, Section XI, Appendix L to manage the effects of EAF.

4.3.3.3 UFSAR Supplement

SLRA appendix A1, section 19.3.3.3, and appendix A2, section 19.3.3.3, provide the UFSAR supplement summarizing the EAF analysis of the RCPB components and piping for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections, consistent with the review procedures in SRP-SLR section 4.3.3.2.

Based on its review of the UFSAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR section 4.3.2.2 and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the EAF TLAA for the RCPB components and piping, as required by 10 CFR 54.21(d).

4.3.3.4 Conclusion

Based on its review, the staff concludes the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of EAF on the intended functions of the RCPB components and piping will be adequately managed by the fatigue monitoring AMP and the pressurizer surge line AMP, in conjunction with the flaw tolerance evaluation per ASME Code, Section XI, Appendix L, for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.3.4 High-Energy Line Break Analyses (Unit 2 Only)

4.3.4.1 Summary of Technical Information in the Application

SLRA section 4.3.4, as supplemented by letter dated June 13, 2022 (ML22164A802), describes the applicant's TLAA on the HELB analyses of ASME Code, Section III, Class 1 and non-Class 1 piping systems. As described in St. Lucie Unit 1 UFSAR section 3.6 and appendices 3C and 3D, the HELB analysis for St. Lucie Unit 1 postulates that circumferential and longitudinal pipe breaks can occur at any location along the piping. Therefore, the St. Lucie Unit 1 HELB analysis does not involve time-limited assumptions in the break location postulation and the HELB analysis is not a TLAA for Unit 1.

The break location postulation of the St. Lucie Unit 2 HELB analysis uses the CUF criterion for Class 1 piping and the allowable stress criterion for non-Class 1 piping. Since the CUF and allowable stress criteria involve time-dependent transient cycles, the St. Lucie Unit 2 HELB analysis is identified as a TLAA.

The applicant dispositioned the St. Lucie Unit 2 HELB TLAA for Class 1 piping systems in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of aging on the intended functions of the HELB break locations based on CUFs will be adequately managed for the subsequent period of operation by the fatigue monitoring AMP. In addition, the applicant dispositioned the St. Lucie Unit 2 HELB TLAA for non-Class 1 piping systems in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analysis remains valid for the subsequent period of extended operation.

4.3.4.2 Staff Evaluation

The staff reviewed the applicant's HELB TLAA for St. Lucie Unit 2 Class 1 piping systems and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR section 4.3.3.1.1.3 and the acceptance criteria in SRP-SLR section 4.3.2.1.1.3. The staff also reviewed the applicant's HELB TLAA for St. Lucie Unit 2 non-Class 1 piping systems and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR section 4.3.3.1.1.1 and the acceptance criteria in SRP-SLR section 4.3.2.1.1.1.

For St. Lucie Unit 1, the staff reviewed UFSAR section 3.6.2 and appendices 3C and 3D and confirmed that the HELB analysis for St. Lucie Unit 1 piping systems postulates that circumferential and longitudinal pipe breaks can occur at any location along the piping. The staff finds that the applicant appropriately determined that the St. Lucie Unit 1 HELB analysis is not a TLAA because the HELB analysis does not involve a time-dependent assumption.

For the St. Lucie Unit 2 HELB analysis for ASME Code, Section III Class 1 piping systems, the applicant explained that the analysis uses the CUF criterion (i.e., CUF greater than 0.1) in the HELB location postulation, as described in St. Lucie Unit 2 UFSAR section 3.6. The applicant also indicated that the fatigue monitoring AMP will be used to ensure the HELB location postulation remains valid for the subsequent period of extended operation. The applicant further provided clarification regarding the use of the fatigue monitoring AMP for the St. Lucie Unit 2 Class 1 HELB analysis in its response to RAI 4.3.4-1 (ML22164A802).

The RAI response clarified the following: (1) the applicant evaluated the effect of the increase in the design cycles of the “loss of feedwater flow” transient from 50 to 500 cycles on the existing HELB analysis for the subsequent period of extended operation; (2) the evaluation regarding the design cycle increase of the “loss of feedwater flow” transient does not identify any new additional HELB locations that have a CUF value greater than the CUF criterion (> 0.1) for HELB location postulation; and (3) if the fatigue monitoring activities identify any additional break locations in accordance with the HELB CUF criterion during the subsequent period of extended operation, the applicant will evaluate the additional HELB locations in terms of associated dynamic effects (such as jet impingement, reactive forces and pipe whip, compartment pressure, and environmental conditions), consistent with the CLB. The staff finds this response acceptable because the applicant described how the fatigue monitoring AMP will be used to ensure that the CUF criterion will not be exceeded for Class 1 piping locations, or that the applicant will evaluate any locations that exceed the criterion. The staff’s evaluation of the fatigue monitoring AMP, including Enhancement 5 related to the St. Lucie Unit 2, Class 1 HELB analysis, is documented in SE section 3.0.3.2.1.

For the St. Lucie Unit 2, Class 1 piping systems, the staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the HELB analysis will be adequately managed for the subsequent period of extended operation because the applicant will implement the fatigue monitoring AMP to ensure that either the CUF criterion will not be exceeded for Class 1 piping locations, or that any additional locations that exceed the criterion will be evaluated. Additionally, the TLAA meets the acceptance criteria in SRP-SLR section 4.3.2.1.1.3 because the applicant proposed to use the fatigue monitoring AMP (SLRA B.2.2.1) to manage the effects of fatigue by monitoring the actual transient cycles and CUF values, consistent with the guidance in SRP-SLR section 4.3.2.1.1.3. The staff’s evaluation of the fatigue monitoring AMP is documented in SE section 3.0.3.2.1.

With respect to the HELB analysis for St. Lucie Unit 2 non-Class 1 piping systems, the applicant explained that the cyclic qualification of the piping systems is based on the number of equivalent full temperature cycles and corresponding stress range reduction factors, as addressed in SLRA section 4.3.2. The applicant also stated that the TLAA evaluations for required stress range reduction factors are implicit fatigue analyses for non-Class 1 piping systems because they are based on the number of fatigue cycles without explicit calculations of CUF values.

As identified in SLRA table 4.3.2-2, the implicit fatigue analyses indicate that the fatigue cycle threshold of 7,000 cycles for the non-Class 1 piping systems, which are in the scope of HELB analysis, will not be exceeded for 80 years of operation. Accordingly, the applicant determined that there is no need to apply a stress range reduction factor of less than 1.0 in the stress analysis, and therefore the existing HELB break locations postulated for St. Lucie Unit 2 non-Class 1 piping systems remain valid for the subsequent period of extended operation.

For the St. Lucie Unit 2 non-Class 1 piping systems within the scope of the HELB analysis, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the HELB analysis remains valid for the subsequent period of extended operation, consistent with the results of the implicit fatigue analyses discussed in SLRA table 4.3.2-2. Additionally, it meets the acceptance criteria in SRP-SLR section 4.3.2.1.1.1 because the applicant demonstrated that the existing HELB locations remain valid for the subsequent period of extended operation.

4.3.4.3 UFSAR Supplement

SLRA appendix A2, section 19.3.3.4 provides the UFSAR supplement summarizing the HELB TLAA for St. Lucie Unit 2. The staff reviewed this section, consistent with the review procedures in SRP-SLR section 4.3.3.2.

Based on its review of the UFSAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR section 4.3.2.2, and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description of its actions to address the HELB TLAA for the St. Lucie Unit 2 Class 1 and non-Class 1 piping systems, as required by 10 CFR 54.21(d).

4.3.4.4 Conclusion

Based on its review, the staff concludes the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the HELB analysis for St. Lucie Unit 2 Class 1 piping systems will be adequately managed for the subsequent period of extended operation by the fatigue monitoring AMP. The staff also concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the HELB analysis for St. Lucie Unit 2 non-Class 1 piping systems remains valid for the subsequent period of extended operation. In addition, the staff concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.4 Environmental Qualification (EQ) of Electrical Equipment

4.4.1 Summary of Technical Information in the Application

SLRA section 4.4 describes the applicant's TLAA for evaluation of EQ of electric equipment for the subsequent period of extended operation. Thermal, radiation, and cyclical aging analyses of plant electrical and instrumentation components located in harsh environments, developed to meet the requirements in 10 CFR 50.49, "Environmental qualification of electric equipment important to safety for nuclear power plants," have been identified as TLAAs.

The applicant dispositioned the TLAA for the EQ of electric equipment in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of aging of electric components on the intended functions will be adequately managed by the EQ of electric equipment AMP (EQ AMP) described in SLRA section B.2.2.3 for the subsequent period of extended operation.

4.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the EQ of electric equipment and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR section 4.4.3.1.3 and the acceptance criteria in SRP-SLR section 4.4.2.1.3.

The EQ requirements established by 10 CFR 50.49 require each applicant to establish a program to qualify electrical equipment so that such equipment, in its end-of-life condition, will meet its performance specifications during and following design basis accidents. An EQ of electric equipment important to safety program, in accordance with the requirements of 10 CFR 50.49, is considered an adequate program for the purposes of license renewal. Electric components in the applicant's EQ AMP identified as having a qualified life equal to or greater than the current operating term (i.e., 60 years) are considered a TLAA for subsequent license renewal.

The staff reviewed SLRA section 4.4 and the associated program basis documents to determine if the applicant's EQ AMP meets the requirement of 10 CFR 54.21(c)(1). The applicant's EQ AMP is implemented per the requirements of 10 CFR 54.21(c)(1)(iii) to show that components evaluated under the applicant's TLAA are adequately managed during the subsequent period of extended operation. The staff reviewed the applicant's EQ AMP, including the management of aging effects, to confirm that electric equipment requiring EQ will continue to operate consistent with the CLB during the subsequent period of extended operation.

The staff also conducted an audit of the information provided in SLRA section B.2.2.3 and the program basis document, including reports provided to the staff during the audit as described in the audit report (ML22188A086). Based on the staff review of SLRA section B.2.2.3 and the results of the audit, the staff concluded that the applicant's EQ AMP program elements are consistent with the GALL-SLR Report section X.E1, "Environmental Qualification of Electric Equipment." The staff's evaluation of the applicant's EQ of electric equipment AMP is documented in SE section 3.0.3.2.3.

The staff also reviewed the applicant's EQ AMP reanalysis attributes evaluation and concludes that it is consistent with SRP-SLR section 4.4.3.1.3 and SRP-SLR table 4.4-1. Reanalysis of an aging evaluation addresses attributes of analytical methods, data collection and reduction method, underlying assumptions, acceptance criteria, ongoing qualification, and corrective action (if acceptance criteria are not met). The applicant noted that 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.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclical aging on the intended functions of the plant electrical and instrumentation and control components located in harsh environments and qualified to meet 10 CFR 50.49 requirements, will be adequately managed for the subsequent period of extended operation. The applicant's EQ AMP manages the effects of thermal, radiation, and cyclic aging using aging evaluation based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49(e)(5), EQ components are refurbished, replaced, or their qualification is extended prior to reaching the aging limit established in the evaluation.

Additionally, the TLAA meets the acceptance criteria in SRP-SLR section 4.4.2.1.3 because the EQ AMP is capable of programmatically managing the qualified life of components within the scope of the program for subsequent license renewal and the continued implementation of the EQ AMP provides assurance that the aging effects will be managed and EQ electric components will continue to perform their intended functions for the subsequent period of extended operation, consistent with the requirements of 10 CFR 54.21(c)(1)(iii).

4.4.3 UFSAR Supplement

SLRA appendix A1, sections 19.2.1.3 and 19.3.4, and appendix A2, sections 19.2.1.3 and 19.3.4, provide the UFSAR supplement summarizing the EQ of electric equipment for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.4.3.2.

The staff also noted that the applicant committed (Commitment No. 3) to continue the existing St. Lucie EQ of electric equipment AMP, including an enhancement to visually inspect accessible, passive EQ equipment for adverse localized environments that could impact qualified life at least once every 10 years, with the first periodic visual inspection performed prior to the subsequent period of extended operation.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR section 4.4.3.2 and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address EQ of electric equipment, as required by 10 CFR 54.21(d).

4.4.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclic aging on the intended functions of the EQ electric equipment will be adequately managed by the EQ of electric equipment AMP for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.5 Concrete Containment Tendon Prestress

4.5.1 Summary of Technical Information in the Application

SLRA section 4.5 describes the applicant’s disposition for the concrete containment tendon prestress forces for the subsequent period of extended operation. The applicant stated that the St. Lucie containments utilize a reinforced concrete shield building without prestressed tendons, and that loss of prestress is not applicable for the St. Lucie containment design. Therefore, there is no loss of prestress TLAA for the St. Lucie containments.

The staff verified that this TLAA is not applicable to the St. Lucie containments because the shield building does not have prestressed tendons. Therefore, the staff finds that the applicant does not need to identify or evaluate this type of TLAA in the SLRA.

4.6 Containment Liner Plate , Metal Containments, and Penetrations Fatigue Analysis

4.6.1 Summary of Technical Information in the Application

SLRA section 4.6, under the subheading “Metal Containment Fatigue,” as amended by Supplement 1 dated April 7, 2022 (ML22097A202), and response to RAI 4.6-1 dated July 11, 2022 (ML22192A078), describes the applicant’s TLAA for fatigue of the St. Lucie Units 1 and 2 steel containment vessels shell, containment penetration nozzles (electrical, fuel transfer, mechanical), personnel air locks and equipment hatches (maintenance, construction) of carbon steel, stainless steel, and nickel alloy materials. The applicant dispositioned the TLAA for these containment components in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation.

SLRA section 4.6, under the subheading “Penetrations Fatigue,” as amended by Supplement 1 dated April 7, 2022 (ML22097A202), describes the applicant’s TLAA for fatigue of the St. Lucie Units 1 and 2 containment mechanical penetration assembly expansion bellows of stainless steel material. The applicant dispositioned the TLAA for these mechanical penetrations assembly expansion bellows in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the subsequent period of extended operation.

4.6.2 Staff Evaluation

Metal Containment Fatigue

The staff reviewed the applicant’s TLAA, as amended, on metal containment fatigue and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR section 4.6.3.1.1.2 and the acceptance criteria in SRP-SLR section 4.6.2.1.1.2.

The staff noted that, for 80 years of operation, the applicant reevaluated the fatigue waiver TLAAs to include the carbon steel, stainless steel, and nickel alloy materials for the containment components listed in the SLRA tables titled “PSL-1 Containment Vessels Materials” and “PSL-2 Containment Vessels Materials,” which were added to the SLRA by the response to RAI 4.6-1 (ML22192A078). These re-evaluations were in accordance with the codes-of-record (i.e., the six criteria in paragraph N-415.1, “Vessels Not Requiring Analysis for Cyclic Operation” of ASME Code Section III, 1968 edition for Unit 1, and paragraph NB-3222.4(d), “Components Not Requiring Analysis for Cyclic Operation” of ASME Code, Section III, 1971 edition for Unit 2). The staff noted that the fatigue waiver criteria are the same in the 1968 and 1971 code-of-record editions, respectively, for Unit 1 and Unit 2. The staff reviewed Unit 1, UFSAR table 3.8-5 and Unit 2, UFSAR table 3.8-10 and verified that the materials evaluated constitute all the materials used for the St. Lucie Units 1 and 2 steel containment vessels shell, containment penetration nozzles (electrical, fuel transfer, mechanical), and personnel air locks and equipment hatches (maintenance, construction); therefore, the fatigue waiver evaluations are inclusive and bounding of all the above-stated containment pressure retaining boundary components in addition to the containment vessel shell.

The staff reviewed SLRA section 4.6, as amended, and noted that the applicant evaluated, consistent with the codes-of-record, fatigue cycles through the end of the subsequent period of extended operation due to the following: (1) atmospheric-to-operating pressure cycle, (2) normal operation pressure fluctuation, (3) temperature difference – startup and shutdown, (4) temperature difference – normal operation, (5) temperature difference – dissimilar materials, and (6) mechanical loads. The staff further noted that the applicant used 500 atmospheric-to-operating pressure cycles (including that due to Type A integrated leak rate tests) and 500 startup and shutdown temperature cycles in the fatigue waiver parameter evaluations, which correspond to the plant design transients for plant heat up and cooldown. The staff reviewed section 3.9 of the Unit 1 UFSAR and section 3.9 of the Unit 2 UFSAR and verified that the number of lifetime occurrences of heatup and cooldown transients considered in the design of the plant systems is 500. The staff also reviewed SLRA tables 4.3.1-1 and 4.3.1-2 and verified that the bounding 80-year projection for plant heatup and cooldown cycles is 143, and therefore the 500 cycle inputs used in the fatigue waiver evaluations is bounding of the range of temperature and pressure fatigue cycles projected through the end of the subsequent period of extended operation. The staff also reviewed the metal containment fatigue waiver parameter evaluations in SLRA section 4.6 and noted that the material inputs used for the St. Lucie Units 1 and 2 steel containment vessel shells, containment penetration nozzles, and personnel air locks and equipment hatches, based on limiting material stress intensities and allowable cycles from the applicable fatigue curves in the code-of-record, were acceptable because they were bounding values. Based on the above, the staff finds acceptable the applicant's conclusion that the fatigue waiver re-evaluations for the containment vessel components demonstrate that all six fatigue waiver criteria in paragraphs N-415.1 and NB-3222.4(d), in the codes-of-record for Unit 1 and Unit 2, respectively, have been satisfied for the subsequent period of extended operation.

Based on the above review of the SLRA, as amended by Supplement 1 (ML22097A202) and the response to RAI 4.6-1 (ML22192A078), the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the fatigue waiver parameter evaluations have been reevaluated for the containment vessel components stated above, consistent with the six fatigue waiver criteria in the applicable codes-of-record stated above, based on bounding numbers of occurrences and severities of applicable cyclic loads for the subsequent period of extended operation and have been shown to meet the corresponding code acceptance criteria.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the reevaluation analyses for fatigue of the St. Lucie Units 1 and 2 steel containment vessels shell, containment penetration nozzles, and personnel air locks and equipment hatches have been projected to the end of the subsequent period of extended operation. Additionally, the reevaluation analyses meet the acceptance criteria in SRP-SLR section 4.6.2.1.1.2 because the six fatigue waiver criteria in paragraph N-415.1 of the 1968 Edition of the ASME Code, Section III (for Unit 1) and paragraph NB-3222.4(d) of the 1971 Edition of the ASME Code, Section III (for Unit 2), were satisfied for conservatively projected bounding design cycles for 80 years of operation due to fluctuations in operating temperature and pressure, including Type A integrated leak rate tests and mechanical loads.

Penetrations Fatigue

The staff reviewed the applicant's amended TLAA on mechanical penetrations assembly expansion bellows fatigue and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR section 4.6.3.1.1.1 and the acceptance criteria in SRP-SLR section 4.6.2.1.1.1.

The staff noted that the mechanical penetrations assembly expansion bellows were designed to withstand a lifetime total of 7000 cycles of expansion and compression due to maximum operating thermal expansion and 200 cycles of seismic motion (i.e., 5 operating basis earthquake events of 40 cycles each) and differential settlement/movement (between the containment vessel and the shield building). The staff also noted that differential settlement/movements between the steel containment and the concrete shield building, which support the primary and secondary penetration bellows, is unlikely or expected to be minimal through the subsequent period of extended operation because the metal containment and the shield building are on a common rigid concrete basemat foundation. The staff audited (as described in the audit report, ML22188A086) calculation PSL-ENG-LRTA-00-051 and reviewed Unit 1 UFSAR section 3.8.2.10 and appendix 3G, and Unit 2 UFSAR section 3.8.2.1.1 and verified that the mechanical penetration expansion bellows were originally designed to withstand a lifetime total of 7000 cycles of operating thermal expansion and compression, and 200 cycles of operating basis earthquake (OBE) seismic motion and differential movements. The staff further reviewed SLRA tables 4.3.1-5, "Additional St Lucie Unit 1 Design Transients," and 4.3.1-6, "Additional St Lucie Unit 2 Design Transients," and verified that the 80-year projection for OBE events is 2 (i.e., 80 cycles), which is significantly less than the 200 design cycles and allows significant margin to also accommodate any potential but unlikely differential movements. The staff also reviewed SLRA table 4.3.2-2 “Projected Number of Full Temperature Cycles,” and verified that the projected temperature cycles for 80 years of operation for the systems that incorporate the containment penetration expansion bellow are all less than 7000 cycles. Therefore, the staff finds that the applicant’s conclusion that the 7000 thermal cycles and 200 cycles of seismic motion and differential movements evaluated in the original fatigue design of the mechanical penetration expansion bellows are bounding for the subsequent period of extended operation is acceptable.

The staff finds that the applicant has demonstrated in SLRA section 4.6, as amended by Supplement 1, that the original fatigue parameter evaluations of the containment mechanical penetrations assembly expansion bellows remain valid for the subsequent period of extended operation.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for fatigue of the St. Lucie Units 1 and 2 containment mechanical penetration assembly expansion bellows remain valid for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR section 4.6.2.1.1.1 because the numbers of occurrences and severities of assumed cyclic loads are not projected to be exceeded during the subsequent period of extended operation.

4.6.3 UFSAR Supplement

SLRA appendix A1, section 19.3.5, and appendix A2, section 19.3.5, both as amended by Supplement 1 (ML22097A202) and the response to RAI 4.6-1 (ML22192A078), provide the UFSAR supplement summarizing the fatigue evaluation for the St. Lucie Units 1 and 2, respectively, steel containment vessels shell, containment penetration nozzles, personnel air locks and equipment hatches, and mechanical penetrations assembly expansion bellows. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.6.3.2.

Based on its review, the staff finds that the UFSAR supplement, as amended, meets the acceptance criteria in SRP-SLR section 4.6.2.2, and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address fatigue of the St. Lucie Units 1 and 2 steel containment vessels shell, containment penetration nozzles, personnel air locks and equipment hatches, and mechanical penetrations assembly expansion bellows, as required by 10 CFR 54.21(d).

4.6.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the effects of fatigue on the intended functions of the St. Lucie Units 1 and 2 steel containment vessels shell, containment penetration nozzles, and personnel air locks and equipment hatches have been projected to the end of the subsequent period of extended operation. Based on its review, the staff additionally concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the evaluations of the effects of fatigue on the intended functions of the St. Lucie Units 1 and 2 containment mechanical penetrations assembly expansion bellows remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluations for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7 <u>Other Plant-Specific TLAAs</u>

SLRA section 4.7, "Other Plant-Specific Time-Limited Aging Analyses," provides the applicant's evaluations of those plant-specific analyses in the CLB that have been identified as plant-specific TLAAs. The applicant identifies that the following analyses in the CLB qualify as plant-specific TLAAs for the SLRA:

- "Leak-Before-Break of Reactor Coolant System Piping" (SLRA section 4.7.1)
- "Alloy 600 Instrument Nozzle Repairs" (SLRA section 4.7.2)
- "Unit 1 Core Support Barrel Repairs" (SLRA section 4.7.3)
- "Reactor Coolant Pump Flywheel Fatigue Crack Growth" (SLRA section 4.7.4)
- "Reactor Coolant Pump Code Case N-481" (SLRA section 4.7.5)
- "Crane Load Cycle Limits" (SLRA section 4.7.6)
- "Flaw Tolerance Evaluation for Cast Austenitic Stainless Steel (CASS) RCS Piping Components" (SLRA section 4.7.7)
- Unit 2 Structural Weld Overlay Primary Water Stress Corrosion Cracking (PWSCC) Crack Growth Analyses" (SLRA Section 4.7.8)

4.7.1 Leak-Before-Break of Reactor Coolant System Loop Piping

4.7.1.1 Summary of Technical Information in the Application

SLRA section 4.7.1, as supplemented by letter dated June 13, 2022 (ML22164A802), describes the applicant's TLAA on the leak-before-break (LBB) evaluation for the RCS piping. The time-limited elements of the analysis are a postulated crack stability analysis related to the period of plant operation, and loss of fracture toughness due to thermal aging of the CASS nozzle safe-ends. This section, as amended, also evaluated the potential effect on the LBB analysis due to PWSCC in susceptible Alloy 82/182 dissimilar metal weld material.

The applicant dispositioned the TLAA for the LBB evaluation of the RCS piping in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation.

4.7.1.2 Staff Evaluation

The staff reviewed the LBB TLAA for the RCS piping and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR section 4.7.3.1.2 and the acceptance criteria in SRP-SLR section 4.7.2.1.2.
In addition, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition (SRP, NUREG-0800)," Section 3.6.3, Revision 1, "Leak-Before-Break Evaluation Procedures," March 2007, provides detailed guidance for LBB analyses and staff's review of the analyses. The SRP guidance addresses acceptable methods to meet 10 CFR part 50, appendix A, General Design Criteria (GDC) 4 regarding LBB analyses.

The applicant's updated LBB analysis for 80 years of operation is documented in WCAP-18617, Revision 1, "Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for the St. Lucie Units 1 and 2 Subsequent License Renewal" (Attachment 5 of Enclosure 5 to the SLRA). The applicant stated that the fatigue crack growth (FCG) analyses originally included in CEN-367-A that were defined for 40 years of operation used generic design basis transient cycles for the RCS components for St. Lucie Units 1 and 2 and were compared to the projected cycles for 80 years. The comparison indicates that the original 40-year transient cycles envelop the projected 80 years of operation and will not exceed the original transient cycles that were defined for 40 years. Therefore, the staff finds that the analysis summarized in CEN-367-A for FCG remains valid for the subsequent period of extended operation.

Based on NUREG/CR-4513, Revision 2, "Estimation of Fracture Toughness of Cast Stainless Steel during Thermal Aging in LWR Systems," the applicant stated that the fracture toughness correlations used for the fully aged condition is applicable for plants operating at ≥15 EFPY for the A351-CF8M CASS materials. Therefore, the use of the fracture toughness correlations is applicable for the fully aged or saturated condition of the St. Lucie Units 1 and 2 reactor coolant pump (RCP) nozzle safe-ends. The applicant stated that WCAP-18617, Revision 1, included a recalculation of delta ferrite and fracture toughness properties based on NUREG/CR-4513, Revision 2. The chemistry data for the fracture mechanics parameters were obtained from the primary loop piping certified materials testing reports (CMTRs). The applicant stated that WCAP-18617, Revision 1, included a recalculation of the CASS fracture toughness properties based on NUREG/CR-4513, Revision 2, and the LBB analysis results for the CASS safe-end locations are acceptable for thermal aging effects and for PWSCC. The staff reviewed the calculations described in WCAP-18617, Revision 1, and concluded that they accurately consider the loss of fracture toughness for the CASS materials, and the LBB analyses are acceptable.

The staff issued RAI 4.7.1-1 requesting the applicant to specifically describe the conservative evaluations that were made to determine that PWSCC of Alloy 82/182 dissimilar metal weld material is not a concern and that PWSCC is not a potential source of pipe rupture as described in SRP Section 3.6.3, Revision 1. In addition, the staff requested, if the applicant is not considering an Alloy 690/52/152 overlay, that the applicant provide additional information to identify how the applicant is planning to monitor these welds for potential leakage from cracks or flaws. By letter dated June 13, 2022 (ML22164A802), the applicant provided a response to RAI 4.7.1-1 to demonstrate that PWSCC is not a concern and to describe what programs they will use to monitor the welds for potential leakage from cracks or flaws.

In its response, the applicant stated that the LBB evaluations of the St. Lucie Units 1 and 2 Alloy 82/182 locations at the RCP suction and discharge nozzles include a conservative factor of 1.69 on the leakage flaw size, which increased the leakage flaw size for the required margin of 10 on the leak rate. This factor accounts for the PWSCC morphology characteristics (e.g., surface roughness and number of turns) on the leakage rate of a given leakage crack size. The applicant stated that the evaluations for these locations with the conservative factor meet the required margins for LBB per SRP section 3.6.3, Revision 1. Additionally, the applicant stated that the St. Lucie Units 1 and 2 TS identify actions that require a reactor shutdown in the event of RCPB through-wall leakage. Considering the long periods of time for crack growth from a leakage crack size to a critical crack size and TS-required action for the RCPB through-wall leakage, the applicant concluded that sufficient time is available for the flaw to be identified and for the reactor to be shut down.

In addition, the applicant stated that all St. Lucie Units 1 and 2 Alloy 600/82/182 components/welds in higher temperature locations have either been mitigated or replaced with PWSCC-resistant materials. The only exceptions are the lower temperature St. Lucie Units 1 and 2 RCP suction and discharge nozzle Alloy 82/182 dissimilar metal welds. Due to the low susceptibility of PWSCC in these lower temperature applications, there are no plans to mitigate these Alloy 82/182 dissimilar metal welds. The applicant stated the cracking of nickel alloy components and loss of material due to boric acid-induced corrosion in RCPB components AMP (SLRA section B.2.3.5) will continue to manage the aging effect of PWSCC for St. Lucie Units 1 and 2 RCP suction and discharge nozzle dissimilar metal welds. The applicant stated that this AMP will be used in conjunction with the ASME Code Section XI, inservice inspection, subsections IWB, IWC, and IWD AMP (SLRA section B.2.3.1), the boric acid corrosion AMP (SLR section B.2.3.4), and the water chemistry AMP (SLR section B.2.3.2).

The applicant stated that the ASME Code, Section XI, inservice inspection, subsections IWB, IWC, and IWD AMP is a condition monitoring AMP that imposes inservice inspection requirements for ASME Class 1, 2, and 3 pressure retaining components and integral attachments. ASME Code Case N-770-5 currently provides the requirements for visual and volumetric examination of the St. Lucie Units 1 and 2 RCP suction and discharge nozzle dissimilar metal welds. The boric acid corrosion AMP is credited for the identification, evaluation, and corrective actions for potential borated water leaks in St. Lucie Units 1 and 2 RCP suction and discharge nozzle dissimilar metal welds. In addition, walkdowns for the detection of boric acid leakage from these locations are performed every outage during plant cooldown and heatup. The main objective of the water chemistry AMP with regard to St. Lucie Units 1 and 2 RCP suction and discharge nozzles is to mitigate cracking of the dissimilar metal welds due to stress corrosion cracking (SCC) and related mechanisms when exposed to a treated water environment. These AMPs are informed and enhanced, when necessary, through the systematic and ongoing review of both plant-specific and industry operating experience, including research and development, such that the effectiveness of the AMPs is evaluated consistent with the discussion in NUREG-2191, appendix B.

As an added measure of safety, the applicant adopted an Nuclear Energy Institute (NEI) 03-08, “Guidance for the Management of Materials Issues,” provision to improve the RCS leak detection capability in part due to the concern of PWSCC of Alloy 600 materials. The enhanced leak rate monitoring and detection procedure monitors specific values of unidentified leakage, seven-day rolling average, and baseline means. Action levels are initiated as low as when the unidentified leak rate exceeds 0.1 gpm. The enhanced leak detection capability provides an increased level of safety such that if a flaw were to grow through wall, it would be detected prior to growing to a safety-significant size.

Based on the applicant’s actions, including use of PWSCC crack morphology for the LBB calculations, the staff finds the applicant’s consideration of possible PWSCC of the Alloy 82/182 dissimilar metal weld material to be acceptable because the actions will minimize the impacts of PWSCC on the LBB criteria.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for the RCS piping have been projected to the end of the subsequent period of extended operation. Additionally, the staff finds that the TLAA meets the acceptance criteria in SRP-SLR section 4.7.2.1.2 because the original FCG analysis, the recalculated CASS fracture toughness, and the applicant’s analyses and activities to monitor welds for PWSCC adequately demonstrate that the effects of RCS pipe breaks need not be considered for the 80-year subsequent period of extended operation.

4.7.1.3 UFSAR Supplement

SLRA appendix A1, section 19.3.6.1, and appendix A2, section 19.3.6.1, provide the UFSAR supplement summarizing the LBB TLAA for the RCS loop piping for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.7.3.2.

Based on its review of the UFSAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR 4.7.2.2 and is therefore acceptable. The staff also finds that the applicant provided an adequate summary description to address the LBB TLAA for the RCS loop piping as required in 10 CFR 54.21(d).

4.7.1.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the LBB analysis has been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7.2 Alloy 600 Instrument Nozzle Repairs

4.7.2.1 Summary of Technical Information in the Application

SLRA section 4.7.2 describes the applicant’s TLAA for small-bore Alloy 600 nozzles that have repairs or mitigations to prevent future leakage. The Alloy 600 nozzle repairs were evaluated based on corrosion and fracture mechanics analyses justifying the acceptability of potential or hypothetical indications in the J-groove weld.

The applicant dispositioned the TLAA for the small-bore Alloy 600 nozzles identified in SLRA tables 4.7.2-1 and 4.7.2-2 for St. Lucie Units 1 and 2, respectively, in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the subsequent period of extended operation.

4.7.2.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for the small-bore Alloy 600 nozzles and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR-SLR section 4.7.3.1.1 and the acceptance criteria in SRP-SLR Section 4.7.2.1.1.

SLRA tables 4.7.2-1 and 4.7.2-2 identify the type of nozzle repair, either a half-nozzle repair or a sleeve repair, for each nozzle. The potential safety concerns are a hypothetical flaw remaining in the J-groove weld continuing to grow to failure or corrosion of the exposed low-alloy steel pressure boundary components of sufficient extent to allow failure. The repair evaluation was provided by the applicant based on the fracture mechanics analysis provided in Combustion Engineering Owners Group (CEOG) Topical Report CE NPSD-1198-P and WCAP-15973-P-A (ML050700431). In addition, the applicant reassessed the repairs for 80 years of operation in accordance with the request in the NRC SE related to WCAP-15973-P (ML050180528) under the Westinghouse Reports LTR-SDA-20-097-NP, Revision 2 (Attachment 11 to Enclosure 4 of the SLRA), and LTR-SDA-20-097-P, Revision 2 (Attachment 6 to Enclosure 5 of the SLRA).

Through this assessment, the applicant noted that the limiting allowable bore diameters would not be exceeded at the end of 80 years of operation, considering the carbon and low-alloy steel borated water corrosion that could occur. The applicant reconciled that the FCG and flaw stability evaluations in WCAP-15973-P remain valid for 80 years of operation. The applicant concluded that unacceptable growth of the existing flaws by stress corrosion into the vessels or piping is improbable.

The staff reviewed the applicant's boric acid corrosion calculations and finds the inputs, assumptions, and methodology acceptable. The staff verified that the corrosion rate used in the calculation in WCAP-15973-P-A bounds the corrosion rates of 1.20 mils per year (mpy) for St. Lucie Unit 1 and 1.34 mpy for St. Lucie Unit 2, which the applicant notes are based on the plant power generation data (e.g., the plant operating conditions). Further, these rates and the associated assumptions will be examined every inservice inspection interval change to update the proposed alternatives that authorize the repairs. The staff verified that the results of the corrosion assessment show that the repair bore diameter at the end of 80 years of operation is below the limiting allowable diameter for all of the half-nozzle repair designs. The staff also verified the applicant's assessment of corrosion for the sleeve repair design, noting that operating experience continues to demonstrate the effectiveness of the repair to isolate the susceptible material from the primary coolant, such that excessive corrosion is prevented. Therefore, the staff finds that the applicant has adequately demonstrated that these repairs will not result in unacceptable levels of borated water corrosion for the 80-year subsequent period of extended operation.

The staff reviewed the applicant's FCG and flaw stability evaluation to ensure it remains bounded by WCAP-15973 for the 80-year subsequent period of extended operation. The applicant addressed the four items identified in the NRC SE for WCAP-15973-P-A to demonstrate continued applicability in SLRA section 4.7.2. These items include the plant-specific information being bounded by the corresponding information in Calculation Report CN-CI-02-71, Revision 01, for (1) geometry; (2) limiting cooldown curves not exceeding the analyzed profiles shown in Figure 6-2(a) of the calculation, as applicable; (3) the Charpy USE, as applicable, being bounded by the analysis of the calculation, and finally (4) the calculation design cycles bounding all foreseeable plant transients for St. Lucie Units 1 and 2 for 80 years of operation. The staff found items (1) through (3) remain acceptable as previously reviewed and approved by the NRC for installation and the most recent inservice inspection interval for each plant. The staff found item (4) was acceptable as the total number of cycles for the subsequent period of extended operation remains below the bounding value used in WCAP-15973. Therefore, the staff finds the FCG and flaw stability evaluation to remain valid for the subsequent period of extended operation.

The staff also reviewed the applicant's assessment of carbon and low-alloy steel SCC. The applicant cited the SCC assessment of WCAP-15973, which indicated through field experience and laboratory observations that SCC of carbon and low-alloy steels in pressurized water reactor conditions is not likely for CE plants and is not a concern. The NRC SE for WCAP15973 found the use of this assessment to be acceptable if concentrations for dissolved oxygen, halide ions, and sulfate ions were maintained and monitored. The staff verified these concentration limits were met with sufficient margin to allow continued use of the SCC assessment of WCAP-15973-P to be used for St. Lucie Units 1 and 2 for 80 years of operation. Therefore, the staff finds the applicant's evaluation of stress corrosion cracking to remain acceptable for the subsequent period of extended operation.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the small-bore Alloy 600 nozzles remain valid for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR section 4.7.2.1.1 because the analyses are shown to be bounding for corrosion, FCG and stability, and SCC during the subsequent period of extended operation.

4.7.2.3 UFSAR Supplement

SLRA appendix A1, section 19.3.6.2, and appendix A2, section 19.3.6.2, provide the UFSAR supplement summarizing the TLAA for the Alloy 600 instrument nozzle repairs for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.7.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address Alloy 600 instrument nozzle repairs, as required by 10 CFR 54.21(d).

4.7.2.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the small-bore Alloy 600 nozzles remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7.3 Unit 1 Core Support Barrel Repairs Plug Preload Relaxation

4.7.3.1 Summary of Technical Information in the Application

SLRA section 4.7.3 contains a description of the applicant’s TLAA related to the Unit 1 core support barrel (CSB) repair plug-flange deflections. This TLAA considers the effects of irradiation-induced stress relaxation on the CSB expandable plug preload. A related TLAA on the fatigue analysis of the CSB middle cylinder is addressed in section 4.3.1 of the SLRA and evaluated in SE section 4.3.1.

The applicant dispositioned the Unit 1 CSB repairs in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the CSB repair plug deflection analysis has been projected to the end of the subsequent period of extended operation.

4.7.3.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for the Unit 1 CSB repairs and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR section 4.7.3.1.2 and the acceptance criteria in SRP-SLR section 4.7.2.1.2.

The staff reviewed the following documents because they provide relevant information regarding degradation in the CSB and neutron fluence data.

1. Westinghouse letter report LTR-SDA-20-104-P (proprietary), Revision 3, which is Attachment 7 to Enclosure 5 of the SLRA. This letter report contains the calculation of the plug-flange deflection to the end of the subsequent period of extended operation based on irradiation-induced stress relaxation, a process in which the stress in the material under load decreases with time.

2. NUREG-1779, "Safety Evaluation Report Related to License Renewal of St. Lucie Nuclear Plant, Units 1 and 2," (ML032940205). This document contains the NRC staff's review of the applicant's initial license renewal application for the 60-year operating license, which also discussed the Unit 1 CSB repair.

3. Westinghouse letter report LTR-AMLR-18-57 (proprietary), Revision 1, "Disposition of Indications Observed in the CSB and Core Shroud at St. Lucie Unit 1." By letters dated February 11 and August 19, 2019 (ML19044A636 and ML19232A095, respectively), the applicant submitted this report for information. The report contains a flaw evaluation of the indications detected in the CSB and neutron fluence data that the staff used to verify the acceptability of the neutron fluence used in the plug-flange deflection calculation for the subsequent period of extended operation.

4. Westinghouse report WCAP-18452-P, Revision 1, "St. Lucie Unit 1 CSB and Core Shroud Flaw Analysis," (proprietary). The applicant submitted, for information, this report in a letter dated April 30, 2020 (ML20134J047). This report provides the results of inspection performed on the CSB in 2019, flaw growth calculations, and neutron fluence data. The applicant's inspection results showed that the 2019 inspection did not identify any anomaly or flaw growth from the 2018 inspection. The staff noted that the CSB repair plug is an expandable design that allows the plug to be preloaded against the CSB. The plug consists of a thin-wall cylinder with a pre-formed flange. The plug is inserted and expanded in the crack-arrestor hole on the wall of the CSB. Thus, the flange is bent, and the plug is preloaded. The preload is required to provide proper seating of the plugs and to prevent movement of the plugs from hydraulic drag loads, resulting from the movement of reactor coolant in the reactor vessel. The irradiation-induced stress relaxation reduces plug-flange preload. The relaxation of the preload is manifested in the plug-flange deflection, which could be quantified by measuring the deflection of the plug-flange.

The applicant defined the preload criteria as (a) the minimum deflection requirement required to maintain the plug preload over the operating life of the plant, and (b) the actual plug-flange deflection measurement tool readings must be greater than or equal to the required minimum deflection values. The applicant determined the acceptance criteria based on the applied hydraulic drag forces, relative thermal expansion effects, and irradiation-induced stress relaxation of the plug or flange over the life of the plant. These criteria need to be satisfied to demonstrate that the plug has sufficient preload to perform its intended function over the operating life of the plant.

In the review of the initial license renewal application, the staff determined that the applicant's reanalysis of the plug preload demonstrated that the plugs have sufficient preload to perform their intended function over the 60-year operating life of the plant. For the 80-year SLRA, the staff reviewed the applicant's letter report LTR-SDA-20-104-P evaluation (Attachment 7 to Enclosure 5 of the SLRA). The staff noted that for the three critical plug locations, the applicant recalculated the required minimum plug-flange deflection using a revised neutron fluence that was projected to the end of subsequent license renewal period of 80 years.

The applicant used the same method to evaluate the plug-flange deflection for the subsequent period of extended operation as in the initial license renewal application in 2001. The applicant calculated the required minimum plug-flange deflection from the end of cycle 6 to 72 EFPY based on the 72-EFPY neutron fluence. To determine the acceptability of the neutron fluence used in the applicant's calculation, the staff reviewed SLRA section B.2.2.2, which discusses the applicant's neutron fluence monitoring program, which was used for the fluence projections to 72 EFPY. The staff also reviewed the neutron fluence values in WCAP-18452-P, Revision 1, and LTR-AMLR-18-57, Revision 1. Based on the finding in section 3.0.3.2.2 of this SE that the neutron fluence monitoring program is acceptable, the staff has determined that the applicant's neutron fluence projections for 72 EFPY for the RVI are acceptable. The staff finds that, for the plug-flange calculations, the applicant's projected neutron fluence used for 72 EFPY is acceptable because the staff determined that the applicant's neutron fluence projections follows the acceptable methodology.

The applicant recalculated the plug preloads based on irradiation-induced stress relaxation from the end of cycle 6 to the end of the 80-year plant operating period. From the preload relaxation calculation, the applicant recalculated the required minimum plug-flange deflection. The staff finds that actual plug-flange deflection measurement tool readings exceed the required minimum deflection values predicted for 72 EFPY in all cases. Therefore, the staff finds that the actual plug-flange deflection has met the deflection acceptance criterion, and the CSB repair plugs will perform their intended function through the end of the subsequent period of extended operation. The staff also finds that the applicant's TLAA analysis performed for CSB repair plug preload relaxation is acceptable because it used acceptable neutron fluence that is projected to 72 EFPY. The staff further finds that the applicant provided an acceptable demonstration that the plugs will continue to perform their intended function during the subsequent period of extended operation.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that its TLAA analysis for the plug-flange deflection associated with the Unit 1 CSB repair has been projected to the end of the subsequent period of extended operation. Additionally, the TLAA analysis meets the acceptance criteria in SRP-SLR section 4.7.2.1.2 because the TLAA analysis is updated and recalculated demonstrating acceptable plug-flange deflection for the subsequent period of extended operation.

4.7.3.3 UFSAR Supplement

SLRA appendix A, section 19.3.6.3, provides the UFSAR supplement summarizing the TLAA for the Unit 1 CSB repairs. The staff reviewed this section consistent with the review procedures in SRP-SLR section 4.7.3.2.

The staff finds the UFSAR supplement meets the acceptance criteria in SRP-SLR section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the Unit 1 CSB repairs, as required by 10 CFR 54.21(d).

4.7.3.4 Conclusion

Basis on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the Unit 1 CSB repair TLAA has been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7.4 Reactor Coolant Pump Flywheel Fatigue Crack Growth (FCG)

4.7.4.1 Summary of Technical Information in the Application

SLRA section 4.7.4 contains a description of the applicant's TLAA related to the RCP flywheel FCG. These analyses are related to the inspection intervals for the RCP flywheels.

The applicant dispositioned the RCP flywheel FCG TLAA in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the existing RCP flywheel FCG analysis remains valid through the subsequent period of extended operation.

4.7.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the RCP flywheel FCG analysis and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR section 4.7.3.1.1 and the acceptance criteria in SRP-SLR section 4.7.2.1.1.

The RCP flywheels are discussed in sections 5.5.5 and 5.4.1 of the Unit 1 and 2 UFSAR, respectively. During normal operation, the RCP flywheel possesses sufficient kinetic energy to potentially produce high-energy missiles in the unlikely event of failure. The staff determined that the aging effect of concern is fatigue crack initiation in the flywheel. For Unit 1, the RCP flywheel fatigue analysis was identified as a TLAA for the initial license renewal, as documented in section 4.1.2 of NUREG-1779 (ML032940205).

By letter dated October 9, 2019 (ML19282D338), the applicant submitted a license amendment request to revise the RCP flywheel inspection program requirements in the Unit 2 TS to be consistent with the conclusions and limitations specified in the NRC SE for Topical Report SIR-94-080, Revision 1 "Relaxation of RCP Flywheel Inspection Requirements."

The topical report was prepared for a group of five nuclear plants that were constructed based on the CE design. St. Lucie Units 1 and 2 were part of this group of plants covered by the topical report. By letter dated May 21, 1997 (ML20013C076), the staff approved (ML20013C086) the generic use of Topical Report SIR-94-080, Revision 1 (ML20211N492). The approved topical report SIR-94-080 establishes a technical basis for relaxing the three-year RCP flywheel inspection recommended in NRC RG 1.14 "Reactor Coolant Pump Flywheel Integrity" (ML12305A254).

By letter dated November 18, 2020 (ML20259A298), the NRC issued Amendment No. 205 permitting St. Lucie to revise the Unit 2 TS such that the RCP flywheel inspection program requirements are consistent with the conclusions and limitations specified in the NRC SE of Topical Report SIR-94-080.

The staff notes that the fatigue flaw growth in the flywheel is caused by the cyclical loading during the plant heatup and cooldown events. The cycles used in the flywheel fatigue flaw growth calculations is the parameter that is reviewed. The applicant stated that, for Unit 2, the designed lifetime occurrences of plant heatups and cooldowns is 500 cycles based on the original plant 40-year design life. The applicant further stated that the 500 plant heatup and cooldown cycle limit bounds the projected cycles for the 80-year subsequent period of extended operation for both Unit 1 and 2 as discussed in section 4.3.1 of the SLRA. The applicant explained that the RCPs are cycled when filling and venting the RCS prior to unit startup. The applicant estimated three RCP start/stop events during the fill-and-vent activity and one fill-and-vent activity event during each plant evolution. Therefore, the applicant assumed a total of 2000 RCP start/stop cycles (500 cycles x 4 events) for 80 years.

Topical Report SIR-94-080 assumed 4000 RCP start/stop cycles in its FCG calculation, demonstrating that the flywheel will maintain its structural integrity, which is much larger than the 2000 cycles assumed for Unit 2. The applicant explained that, since the 4000 RCP stop/start cycle limit for the Unit 2 analysis is more restrictive than the 100,000 stop/start cycle limit for Unit 1, the Unit 2 limit (i.e., 4000 RCP stop/start cycles) was used to evaluate the flywheel TLAA for both units.

The staff notes that the flywheel FCG analysis in the Topical Report SIR-94-080 considered 4000 RCP start/stop cycles; thus, the staff finds that there is a significant margin between the projected RCP start/stop cycle count of 2000 in the SLRA and the 4000 analyzed cycles in Topical Report SIR-94-080, which the staff approved previously for St. Lucie Unit 2.The staff notes that there is a factor of two between the projected 80 -year start/stop cycles and the analyzed number of cycles (i.e., 2000 cycles vs. 4000 cycles). The staff finds that the 4000 start/stop cycles used in the FCG analysis are bounding and will cover all potential occurrences of start/stop cycles during 80 years of plant operation. Thus, the staff finds that FCG on RCP flywheel resulting from start/stop cycles is adequately addressed for 80 years of plant operation.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the RCP flywheel FCG analyses remain valid for the subsequent period of extended operation. Additionally, the FCG analyses meet the acceptance criteria in SRP-SLR section 4.7.2.1.1 because the applicant demonstrated that the 4000 start/stop cycles used in the Topical Report SIR-94-080, which the staff approved for St. Lucie Unit 2, bound the projected start/stop cycles for the RCP during the subsequent period of extended operation.

4.7.4.3 UFSAR Supplement

SLRA appendix A1, section 19.3.6.4, and appendix A2, section 19.3.6.3, provide the UFSAR supplement summarizing the RCP flywheel FCG analysis for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.7.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the RCP flywheel FCG analysis, as required by 10 CFR 54.21(d).

4.7.4.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the RCP flywheel FCG analysis remains valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7.5 Reactor Coolant Pump Code Case N-481

4.7.5.1 Summary of Technical Information in the Application

SLRA section 4.7.5 describes the applicant's TLAA for the ASME Code Case N-481 analysis of the RCP casings. The TLAA aspects of the analysis are thermal aging of CASS and FCG in the RCP casings.

The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the conclusions reached in CEN-412, Revision 2, related to the implementation of ASME Code Case N-481, remain valid for the subsequent period of extended operation.

4.7.5.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the RCP casing integrity and the corresponding disposition of 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR section 4.7.3.1.1 and the acceptance criteria in SRP-SLR section 4.7.2.1.1.

The staff focused its review on the validity of the crack stability and FCG analyses of the RCP casings at St. Lucie, Units 1 and 2, through the subsequent period of extended operation. The RCPs at St. Lucie, Units 1 and 2, are Byron-Jackson vertical, single bottom suction, horizontal discharge, centrifugal moto-driven pumps fabricated from ASTM A-351, Grade CF-8M CASS material.

ASME Code, Section XI, table IWB-2500-1 requires periodic volumetric inspections of the welds associated with the RCP casings. These types of inspections result in large radiation exposure, which is a personnel safety concern. In March 1990, the ASME Code approved Code Case N-481 to provide an alternative to the volumetric inspection of the RCP casings. The NRC accepted Code Case N--481 in RG 1.147, "Inservice Inspection Code Case Acceptability ASME Code, Section XI Division 1, Revision 9," dated April 1992 (ML13064A120). ASME Code Case N-481 allows the elimination of volumetric examination of the RCP casing with a fracture mechanics-based integrity evaluation supplemented by specific visual inspections. Code Case N-481, items (a), (b), and (c) specify various visual examination requirements.

Code Case N-481, item (d) requires that licensees and applicants "…perform an evaluation to demonstrate the safety and serviceability of the pump casing. The evaluation shall include the following: (1) evaluating material properties, including fracture toughness values; (2) performing a stress analysis of the pump casing; (3) reviewing the operating history of the pump; (4) selecting locations for postulating flaws; (5) postulating one-quarter thickness reference flaw with a length six times its depth; (6) establishing the stability of the selected flaw under the governing stress conditions; (7) considering thermal aging embrittlement and any other processes that may degrade the properties of the pump casing during service…."

In April of 1993, the CEOG published CEN-412, Revision 2, “Relaxation of Reactor Coolant Pump Casing Inspection Requirements,” which contains the results of the site-specific ASME Code Case N-481 flaw evaluations for the RCP casings at St. Lucie, Units 1 and 2. The report concluded that the RCP casings met the necessary requirements to justify relaxation from the ASME 10-year inspection interval requirements for up to 40 years of operation. Specifically, it was determined that it would take 130 years for a postulated flaw to reach a limiting end point crack size of 0.38T, where T is the thickness of the pump casing wall at the analyzed stress point. In CEN-412, Revision 2, an assumed initial flaw size of 8% RCP case thickness with an aspect ratio of 6:1 was chosen and considered to be a conservative estimate of the largest undetectable crack at the time of preoperational inspection. The NRC staff agrees that this postulated initial flaw size remains valid for the subsequent period of extended operation because radiographic testing can detect flaws as small as 2 percent section thickness, and the chosen aspect ratio is assumed to remain the same throughout the growth of the flaw.

In order to determine the acceptability of ASME Code Case N-481 for the subsequent period of extended operation, the applicant chose to confirm that the crack stability and FCG analyses performed in CEN-412, Revision 2, remain valid for 80 years of operation. To do this, Westinghouse performed a reconciliation analysis for the evaluation documented in CEN-412, Revision 2, utilizing the most up-to-date piping loads as well as 80-year design transients and cycles. The reconciliation analyses were performed for the RCP casings and documented in Westinghouse letters LTR-SDA-20-099-NP/P, Revision 2 (Attachment 13 to Enclosure 4 and Attachment 8 to Enclosure 5 of the SLRA, respectively). Section 5 of the letters addresses the design transients and loads, critical locations, initial postulated flaw size, stress intensity factor calculation, FCG rate, and cycles for 80-year operation. The design transients, loads, and critical locations in CEN-412, Revision 2, were determined using Byron-Jackson company stress reports and corresponding RCP specifications. The applicant confirmed that the design reports and specifications were applicable for St. Lucie, Units 1 and 2. The NRC staff reviewed the inputs from CEN-412, Revision 2, to confirm that they were calculated and evaluated conservatively. The staff found that the design transients, loads, and critical locations used were conservatively determined and remain applicable for the analyses for the SLRA. Furthermore, the NRC staff reviewed the stress intensity factor (K_I) and FCG rate calculations based on equations and parameters found in CEN-412, Revision 2, and ASME Code, Section XI. The staff agrees that they remain valid for the 80-year analyses. In CEN-412, Revision 2, the FCG analysis assumed 500 heatup and cooldown cycles plus five loss of secondary pressure cycles. As described in SLRA section 4.3.1 and evaluated in SE section 4.3.1, the projected transient cycles over 80 years of operation is much lower than the 505 cycles analyzed in CEN-412, Revision 2, and therefore it remains valid and conservative for this application.

Section 5 of CEN-412, Revision 2, predicted fracture toughness properties of the RCP casings per NUREG/CR-4513, Revision 0. Section 6 of letter LTR-SDA-20-099-NP/P addresses the RCP casing fracture toughness based on correlations for thermal aging of CASS from NUREG/CR-4513, Revisions 1 and 2. The letter states that the deformation J-integral (J_d) was recalculated using CMTR chemistry data from CEN-412, Revision 2, and guidance in NUREG/CR-4513, Revisions 1 and 2. The letter goes on to describe how the licensee used J_d to develop J-R curves, how the elastic-plastic fracture toughness J_{IC} is determined, and how it is converted to the equivalent linear-elastic fracture toughness K_{JC}. Using both NUREG/CR-4513, Revisions 1 and 2, the J_{IC} and K_{JC} values for each RCP critical heat at both room temperature and 550 °F were listed in tables 6-3 and 6-4 of LTR-SDA-20-099-NP/P. The NRC staff finds that the applicant took the appropriate measures to calculate the limiting fracture toughness values in accordance with the most recent revisions of NUREG/CR-4513.

Finally, to determine that the crack stability and FCG analyses performed in CEN-412, Revision 2, remain bounding for 80 years of operation, LTR-SDA-20-099-NP/P discusses the final critical flaw sizes based on non-ductile propagation, unstable ductile tearing, and flow stress limit in sections 7.1, 7.2, and 7.3, respectively. To address non-ductile propagation, the limiting K_{JC} was compared to a list of applied K_I values for the limiting RCP casing location. By determining the largest applied K_I that satisfied the equation $K_I < K_{JC}$, the crack growth results at the limiting RCP casing location showed that the postulated crack would grow to a critical flaw size 0.4T in 130 years. Because $K_I < K_{JC}$, this limiting location is considered stable against ductile tearing, and therefore fatigue cycling is the only mechanism that could induce crack growth. To account for the critical flaw size based on the flow stress limit, the applicant referred to conservatively calculated flow stress graphs that considered designed, emergency, and faulted conditions. From here, the applicant also determined that the most limiting critical flaw size is at a depth of 0.38T under faulted conditions and this size would be reached in 130 years. Based on its review, the NRC staff finds that all of the evaluation results discussed above were properly calculated, consistent with the findings in CEN-412, Revision 2, and are, therefore, acceptable for the subsequent period of extended operation.

Based on its review, the staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the RCP casing remain valid for the subsequent period of extended operation. Additionally, the applicant's analysis of the TLAA meets the acceptance criteria in SRP-SLR section 4.7.2.1.1 because the crack stability and FCG analyses remain valid for the subsequent period of extended operation, consistent with 10 CFR 54.21(c)(1)(i).

4.7.5.3 UFSAR Supplement

SLRA appendix A1, section 19.3.6.5, and appendix A2, section 19.3.6.4, provide the UFSAR supplement summarizing the RCP casing integrity analysis TLAA for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.7.3.2.

Based on its review of the UFSAR supplement, the staff finds it meets the acceptance criteria in SRP-SLR section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the RCP casing integrity analysis TLAA, as required by 10 CFR 54.21(d).

4.7.5.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the ASME Code Case N-481 analyses for the RCP casings remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7.6 Crane Load Cycle Limit

4.7.6.1 Summary of Technical Information in the Application

SLRA section 4.7.6 describes the applicant's TLAA for crane load cycle limits. The cranes addressed by this TLAAs for Unit 1 are: reactor building polar crane, intake structure bridge crane, spent fuel cask handling crane, auxiliary telescoping jib crane, refueling machine 1-ton hoist, fuel pool bulkhead monorail, and turbine building gantry crane. The cranes addressed by this TLAA for Unit 2 are: charging pump A, B, and C monorails, turbine building gantry crane, reactor polar crane, auxiliary telescoping jib crane, refueling machine and hoist, fuel transfer machine, spent fuel handling machine, refueling canal bulkhead monorail, cask storage pool bulkhead monorail, spent fuel cask handling crane, diesel generator monorails, and intake structure bridge crane.

The applicant dispositioned the TLAA for crane load limits in accordance with10 CFR 54.21(c)(1)(i) by demonstrating that the analyses for the crane load cycle remain valid for the subsequent period of extended operation.

4.7.6.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the identified cranes and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR section 4.7.3.1.1 and the acceptance criteria in SRP-SLR section 4.7.2.1.1.

The applicant addressed this TLAA by estimating the number of cycles of the limiting crane, as opposed to identifying lifts for each crane. The applicant noted that the cranes are used primarily during the refueling outages and only occasionally make lifts at or near their rated capacity. Reviewing past lift data and future projections, the applicant determined that the spent fuel handling machines make the most lifts at or near their rated capacities. The Unit 1 and Unit 2 spent fuel handling machines went into service in 1976 and 1983, respectively. With a change to more frequent full-core offloading, the Unit 2 spent fuel handing machine is projected to be subjected to more full-core offloads than the Unit 1 spent fuel handling machine during their respective 80-year plant lives, and the Unit 2 spent fuel handling machine is bounding for the crane load cycle analysis. Therefore, the applicant identified the Unit 2 fuel handling machine as the limiting crane for the purpose of this TLAA.

Based on historic past lifts and estimated future lifts, the applicant calculated the projected load cycles of 28,440 per 80 years in 4.7.6-1 in section 4.7.6 of the SLRA. The applicant also conservatively doubled the projected load cycles to account for miscellaneous fuel shuffles and determined the total projected load cycles of 56,880 per 80 years. The applicant's conservative total load cycles of 56,880 remains well below the CLB load cycle limit of 100,000 provided for service Class A cranes in CMAA Specification No. 70, 1975.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for the identified cranes remains valid for the subsequent period of extended operation. Additionally, the TLAA meets the acceptance criteria in SRP-SLR section 4.7.2.1.1 because the applicant has demonstrated that the crane load cycle analyses remain below the bounds of the CMAA-70 allowable load cycles and therefore are valid through the subsequent period of extended operation.

4.7.6.3 UFSAR Supplement

SLRA appendix A1, section 19.3.6.6, for Unit 1 and appendix A2, section 19.3.6.5, for Unit 2 provide the UFSAR supplement for this TLAA. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.7.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the crane cycle load limits, as required by 10 CFR 54.21(d).

4.7.6.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the crane load cycle limits remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7.7 Flaw Tolerance Evaluation for CASS RCS Piping Components

4.7.7.1 Summary of Technical Information in the Application

SLRA section 4.7.7 describes the applicant’s TLAA for the flaw tolerance evaluation of CASS RCS piping components for St. Lucie Units 1 and 2. The applicant’s susceptible CASS components are provided in SLRA tables 4.7.7-1 and 4.7.7-2, and the results of the flaw tolerance evaluations for the subsequent period of extended operation are provided in SLRA table 4.7.7-3.

The applicant dispositioned the TLAA for CASS RCS piping components in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the TLAA has been projected to the end of the subsequent period of extended operation.

4.7.7.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for flaw tolerance evaluation of CASS RCS piping components and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR section 4.7.3.1.2 and acceptance criteria in SRP-SLR section 4.7.2.1.2.

The applicant stated that the maximum tolerable flaw sizes used in the initial flaw tolerance evaluation for the initial period of extended operation are also applicable to the subsequent period of extended operation. For the subsequent period of extended operation, the applicant evaluated fracture toughness using the correlations in NUREG/CR-4513, Revision 2, and determined that the correlations used in the initial period of extended operation evaluation (from NUREG/CR-4513, Revision 1) remain bounding. As a result, the flaw tolerance evaluation remains unchanged. The staff reviewed the applicant’s analysis and verified that the applicant appropriately evaluated the fracture toughness and maximum tolerable flaw sizes of the CASS piping components.

Regarding the applicant’s crack growth evaluation, as documented in the audit report (ML22188A086), the staff noted that the methodology of the probabilistic fracture mechanics calculations, stresses, and cycles were essentially the same for the initial period of extended operation and the subsequent period of extended operation. However, there was a large difference in the projected crack sizes. In the SLRA supplement dated April 7, 2022 (ML22097A202), the applicant provided an explanation for the differences in the projections between the results of the initial period of extended operation and subsequent period of extended operation evaluations. In its review of the differences, the staff focused on the surge line because the surge line CASS piping components are the most limiting.

The applicant stated that, when compared with other transients, thermal stratification stress is the dominant stress for FCG for the surge line. Because thermal stratification occurs during heatup and cooldown, the effects of thermal stratification directly correlate with the heatup and cooldown cycles. As an example, while the total number of heatup cycles was 143 for both 60 years and 80 years of operation, the number of annual projected heatup cycles was lower for the subsequent period of extended operation. The yearly lower number of cycles resulted in slower crack growth per year. The staff's review of the applicant's cycle count and cycle projections are documented in SE section 4.3.1.

Additionally, the applicant stated that the evaluations performed for the subsequent period of extended operation refined inputs for stress intensity factors, maximum temperature, and rise time for the FCG calculations. Specifically, the 60-year evaluation for each of these inputs used the maximum value for each transient grouping, while for the 80-year evaluation, the maximum value for each specific transient was used. The applicant stated that this consideration of transient-specific parameters, rather than each transient grouping, resulted in a more accurate calculation and reduced conservativism. The staff noted that SRP-SLR section 4.7.3.1.2 specifically states that applicants may revise their existing TLAAs by reevaluating any overly conservative conditions and assumptions using new or refined analytical techniques and performing the analysis using an 80-year period. The staff also noted that the revised evaluation for the surge line elbow resulted in an 80-year final flaw depth of 0.4452 inches (34 percent through-wall depth), which is significantly less than the tolerable flaw depth of 0.98 inches.

Based on the staff's review of the applicant's crack growth calculations, including the verification that the applicant appropriately used refined input parameters, the staff finds the applicant's flaw tolerance analysis acceptable because it demonstrates that the CASS RCS piping components will be capable of adequately performing their intended function during the subsequent period of extended operation.

The staff finds the applicant has demonstrated, pursuant 10 CFR 54.21(c)(1)(ii), that the TLAA for the flaw tolerance evaluation of CASS RCS piping components have been projected to the end of the subsequent period of extended operation. Additionally, the TLAA meets the acceptance criteria in SRP-SLR section 4.7.2.1.2 because the applicant demonstrated that the most susceptible CASS components were bounded by the applicant's flaw tolerance evaluations with margin.

4.7.7.3 UFSAR Supplement

SLRA appendix A1, section 19.3.6.7, and appendix A2, section 19.3.6.6, provide the UFSAR supplement summarizing the TLAA on the flaw tolerance evaluation for CASS RCS piping components for St. Lucie Units 1 and 2, respectively. The staff reviewed these sections consistent with the review procedures in SRP-SLR section 4.7.3.2.

Based on its review of the UFSAR supplement, the staff finds that the supplement meets the acceptance criteria in SRP-SLR section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of the TLAA for flaw tolerance evaluation of CASS RCS piping components for St. Lucie Units 1 and 2, as required by 10 CFR 54.21(d).

4.7.7.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant 10 CFR 54.21(c)(1)(ii), that the analysis for the flaw tolerance evaluation of CASS RCS piping components has been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7.8 Unit 2 Structural Weld Overlay PWSCC Crack Growth Analyses

4.7.8.1 Summary of Technical Information in the Application

SLRA section 4.7.8 describes the applicant’s TLAA for the St. Lucie Unit 2 PWSCC crack growth analyses for structural weld overlays. These analyses are used as input for the volumetric inspection frequency of the welds.

The applicant dispositioned the TLAA for the pressurizer surge nozzle, relief valve nozzle, hot-leg shutdown cooling nozzles, hot-leg surge nozzle, and hot-leg drain nozzle in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of PWSCC on the intended functions will be adequately managed by the ASME Code Section XI, inservice inspection, subsections IWB, IWC, and IWD AMP for the subsequent period of extended operation.

4.7.8.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for St. Lucie Unit 2’s structural weld overlays and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR section 4.7.3.1.3. and the acceptance criteria in SRP-SLR section 4.7.2.1.3.

The applicant provided updated PWSCC flaw analyses for the subject welds for the 80-year subsequent period of extended operation in Attachment 15 of Enclosure 4 to the SLRA and Attachment 9 of Enclosure 5 of the SLRA. The staff noted that these analyses included consideration of both FCG and growth by PWSCC. The staff reviewed the applicant’s calculations to verify that inputs, assumptions, and methodology were consistent with the current ASME Code, industry guidance, and NRC guidance on flaw evaluations. The applicant uses these calculations to justify volumetric inspection frequencies of the subject welds in accordance with ASME Code Case N-770-5, which is mandated for use by 10 CFR 50.55a(g)(6)(ii)(F).

The staff found the applicant’s analyses methodology and assumptions were conservative in addressing both fatigue and PWSCC growth simultaneously. The staff notes the initial flaw size and flaw paths analyzed were conservative and consistent with ASME Code Case N-740 recommendations. The staff finds the analyses, including a circumferential 360-degree flaw as well as axial flaws to determine limiting condition, to be conservative. The staff finds the fatigue growth methodology for each material is consistent with current ASME Code, industry, and NRC guidance. The staff notes that the applicant's choice of PWSCC growth rates for Alloys 182 and 52M are in accordance with an ASME Code Section XI, Appendix C flaw analysis, which is currently under review for approval by the NRC. The NRC staff asked the applicant what actions it would take if a different PWSCC growth rate were ultimately endorsed. In its response to RAI 4.7.8-1, dated June 13, 2022 (ML22164A802), the applicant explained that, if the NRC endorses an Alloy 52M PWSCC growth rate different from the value used by the applicant, the applicant will reassess the calculations with the NRC-approved Alloy 52M PWSCC growth rate to ensure compliance with the inservice inspection requirements (i.e., Note 10 of ASME Code Case N 770 5 or later version mandated by 10 CFR 50.55a(g)(6)(ii)(F)) during the subsequent period of extended operation. Therefore, the staff finds that the applicant's crack growth analyses adequately justify the inspection frequencies associated with the inservice inspection requirements.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of PWSCC on the intended functions of the St. Lucie Unit 2 structural weld overlay welds will be adequately managed for the subsequent period of extended operation because these welds will continue to be sampled within the ASME Code Section XI, inservice inspection, subsections IWB, IWC, and IWD AMP during the subsequent period of extended operation.

Additionally, the TLAA meets the acceptance criteria in SRP-SLR section 4.7.2.1.3 because the crack growth analyses will be used in conjunction with 10 CFR 50.55a(g)(6)(ii)(F) and ASME Code Case N-770 to establish volumetric inspection frequencies to provide reasonable assurance of structural integrity for the subject welds during the subsequent period of extended operation.

4.7.8.3 UFSAR Supplement

SLRA appendix A2, section 19.3.6.7 provides the UFSAR supplement summarizing the St. Lucie Unit 2 structural weld overlay PWSCC crack growth analysis. The staff reviewed this section consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the staff finds that the USFAR supplement meets the acceptance criteria in SRP-SLR section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address St. Lucie Unit 2 structural weld overlay PWSCC crack growth analysis, as required by 10 CFR 54.21(d).

4.7.8.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of PWSCC growth on the intended functions of the St. Lucie Unit 2 structural weld overlay welds will be adequately managed by the ASME Code Section XI, inservice inspection, subsections IWB, IWC, and IWD AMP for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.8 Conclusion for TLAAs

The NRC staff reviewed SLRA section 4, “Time-Limited Aging Analyses (TLAAs).” Based on its review, the staff concludes that the applicant provided a sufficient list of TLAAs, as defined in 10 CFR 54.3, and that it demonstrated that: (1) the TLAAs remain valid for the subsequent period of extended operation, as required by 10 CFR 54.21(c)(1)(i); (2) the TLAAs have been projected to the end of the subsequent period of extended operation, as required by 10 CFR 54.21(c)(1)(ii); or (3) the effects of aging on the intended function(s) will be adequately managed for the subsequent period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also reviewed the UFSAR supplements for the TLAAs and finds that they contain summary descriptions of the TLAAs for the subsequent period of extended operation sufficient to satisfy the requirements of 10 CFR 54.21(d).

With regard to these matters, the NRC staff concludes that there is reasonable assurance that the activities authorized by the subsequent renewed licenses will continue to be conducted in accordance with the CLB, and that any changes made to the CLB in order to comply with 10 CFR 54.29(a) are in accordance with the Atomic Energy Act of 1954, as amended, and the NRC’s regulations.

SECTION 5 REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

In accordance with Title 10 of the *Code of Federal Regulations* 54.25, “Report of the Advisory Committee on Reactor Safeguards,” the subsequent license renewal application (SLRA) for the St. Lucie Plant (St. Lucie), Units 1 and 2, will be referred to the Advisory Committee on Reactor Safeguards (ACRS) for a review and report. The ACRS also reviews the U.S. Nuclear Regulatory Commission staff’s safety evaluation (SE) for the SLRA. The applicant and the staff will attend a meeting of the full committee of the ACRS to discuss issues associated with the SLRA. After the ACRS completes its review of the SLRA and the SE, it will issue a report discussing the results of its review.

SECTION 6 CONCLUSION

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the subsequent license renewal application (SLRA) for St. Lucie Plant (St. Lucie), Units 1 and 2, in accordance with NRC's regulations and the guidance in NUREG-2192, Revision 0, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants," (ADAMS Accession No. ML17188A158) (SRP-SLR) and NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report" (ADAMS Accession Nos. ML17187A031 and ML17187A204). Title 10 of the *Code of Federal Regulations* (10 CFR) Section 54.29, "Standards for issuance of a renewed license," sets the standards for issuance of subsequent renewed licenses. In accordance with 10 CFR 54.29, the Commission may issue a subsequent renewed license if it finds, among other things, that: (a) actions have been identified and have been or will be taken, such that there is reasonable assurance that the activities authorized by the subsequent renewed license will continue to be conducted in accordance with the current licensing basis and (b) any applicable requirements of Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)," of 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," (addressing environmental review) have been satisfied.

Based on its review of the St. Lucie SLRA, the NRC staff determined that the applicant has met the requirements of 10 CFR 54.29(a). Specifically, actions have been identified and have been taken or will be taken with respect to: (1) managing the effects of aging during the subsequent period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21(a)(1) and (2) time-limited aging analyses that have been identified to require review under 10 CFR 54.21(c).

Concerning 10 CFR 54.29(b), the NRC staff's environmental review under the requirements of 10 CFR Part 51, Subpart A, is ongoing. The staff will publish its environmental review findings separately from this report.

APPENDIX A

SUBSEQUENT LICENSE RENEWAL COMMITMENTS

A. Subsequent License Renewal Commitments

During the U.S. Nuclear Regulatory Commission (NRC) staff's review of the St. Lucie Power Station, Units 1 and 2 (St. Lucie or PSL) subsequent license renewal application, Florida Power and Light Company (FPL or the applicant) made commitments related to the aging management programs (AMPs) used to manage aging effects for structures and components. The following table lists these commitments along with the implementation schedules and sources for each commitment. The subsequent period of extended operation (SPEO) for St. Lucie begins on March 01, 2036, for Unit 1 and April 06, 2043, for Unit 2.

Table A-1 St. Lucie Unit 1 Subsequent License Renewal Commitments

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
1	Fatigue Monitoring (19.2.1.1)	X.M1	Continue the existing PSL Fatigue Monitoring AMP, including enhancement to: a) Update the plant procedure to monitor chemistry parameters that provide inputs to F_{en} factors used in CUF_{en} calculations. b) Update the plant procedure to identify and require monitoring of the 80-year projected plant transients that are utilized as inputs to CUF_{en} calculations. These transients include: • The plant loading/unloading transient and the 10 percent step load increase/decrease transient. c) Update the plant procedure to monitor and track the following transients during the SPEO. • Loss of charging • Loss of letdown • Loss of regenerative heat exchanger (short-term) • Loss of regenerative heat exchanger (long-term) d) Update the plant procedure to identify the corrective action options to take if component specific fatigue limits are approached.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response 1B ML22181A147 RAI Response Set 2 ML22192A078
2	Neutron Fluence Monitoring (19.2.1.2)	X.M2	Continue the existing PSL Neutron Fluence Monitoring AMP, including enhancement to: a) Follow the related industry efforts, such as by the Pressurized Water Reactor Owners Group (PWROG) and use the information from supplemental nozzle region dosimetry measurements and reference cases or other information to provide additional justification for use of the approved WCAP-18124-NP-A or similar methodology for the determination of RPV fluence in regions above or below the active fuel region. b) Include justification that draws from Westinghouse's NRC approved RPV fluence calculation methodology and includes discussion of the neutron source, synthesis of the flux field and the order of angular quadrature (e.g., S8), etc. used in the estimates for projection of TLAA to 80 years.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
3	Environmental Qualification of Electric Equipment (19.2.1.3)	X.E1	Continue the existing PSL Environmental Qualification of Electric Equipment AMP, including enhancement to: a) Visually inspect accessible, passive EQ equipment for adverse localized environments that could impact qualified life at least once every 10 years with the first periodic visual inspection being performed prior to the SPEO.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110
4	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (19.2.2.1)	XI.M1	Continue the existing ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078
5	Water Chemistry (19.2.2.2)	XI.M2	Continue the existing PSL Water Chemistry AMP.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078
6	Reactor Head Closure Stud Bolting (19.2.2.3)	XI.M3	Continue the existing PSL Reactor Head Closure Stud Bolting AMP, including enhancement to: a) Procure reactor head closure stud materials to limit the maximum yield strength of replacement material to a measured yield strength less than 150 ksi and a maximum tensile strength of 170 ksi. b) Preclude the use of molybdenum disulfide (MoS_2) lubricant for the reactor head closure stud bolting. c) Pursuant to 10 CFR 50.55a(z)(1), submit proposed alternatives for relief from the schedule of reactor pressure vessel (RPV) bolting examinations specified in ASME Section XI Code, Table IWB-2500-1, Category B-G-1, and IWB-2420, in order to accommodate an additional set of reactor vessel closure studs, nuts, and washers that are shared between PSL Units 1 and 2 in rotation. A proposed alternative will be submitted for approval for each subsequent ISI interval through the remainder of the SPEO.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 1 ML22164A802 RAI Response Set 2 ML22192A078
7	Boric Acid Corrosion (19.2.2.4)	XI.M10	Continue the existing PSL BAC AMP, including enhancement to: a) Include other potential means to help in the identification of borated water leakage, such as the following, in order to identify potential	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			borated water leaks inside containment that have not been detected during walkdowns and maintenance: • Airborne radioactivity monitoring • Humidity monitoring (for trending increases in humidity levels due to unidentified RCS leakage) • Temperature monitoring (for trending increases in room/area temperatures due to unidentified RCS leakage) • Containment air cooler thermal performance monitoring (for corroborating increases in containment atmosphere temperature or humidity with decreases in cooler efficiency due to boric acid plate out) b) Include a requirement in the PSL Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components AMP implementing documents to document evidence of boric acid residue (plating out of moist steam) inside containment cooler housings or similar locations such as cooling unit drain pans and to enter evidence in to the corrective action program to be evaluated under a boric acid corrosion control (BACC) program evaluation.		
8	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (19.2.2.5)	XI.M11B	Continue the existing PSL Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP, including enhancement to: a) Update the plant modification process to ensure that no additional alloy 600 material will be used in reactor coolant pressure boundary applications during the SPEO or that, if used, appropriate baseline and subsequent inspections per MRP inspection guidance will be put in place.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078
9	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (19.2.2.6)	XI.M12	Continue the existing PSL Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078
10	Reactor Vessel Internals (19.2.2.7)	XI.M16A	Continue the existing PSL Reactor Vessel Internals AMP, including enhancement to: a) Implement the results of the gap analysis or implement the latest NRC-approved version of MRP-227 if it addresses 80 years of operation.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
11	Flow-Accelerated Corrosion (19.2.2.8)	XI.M17	Continue the existing PSL Flow-Accelerated Corrosion AMP, including enhancement to: a) Reassess piping systems excluded from wall thickness monitoring due to operation less than 2% of plant operating time (as allowed by NSAC-202L-R4) to ensure the exclusion remains valid and applicable for operation through 80 years. If actual wall thickness information is not available for use in this re-assessment, a representative sampling approach will be used. This re-assessment may result in additional inspections. b) Extend the erosion inspection plan for the duration of the SPEO. c) Perform opportunistic visual inspections of internal surfaces during routine maintenance activities to identify degradation. d) Revise or provide procedure(s) for measuring wall thickness due to erosion. Wall thickness should be trended to adjust the monitoring frequency and to predict the remaining service life of the component for scheduling repairs or replacements. e) Revise or provide procedure(s) to evaluate inspection results to determine if assumptions in the extent-of-condition review remain valid. If degradation is associated with infrequent operational alignments, such as surveillances or pump starts/stops, then trending activities should consider the number or duration of these occurrences. f) Revise or provide procedure(s) to perform periodic wall thickness measurements of replacement components until the effectiveness of corrective actions have been confirmed. g) Include long-term corrective actions for erosion mechanisms. The effectiveness of the corrective actions should be verified. Include periodic monitoring activities for any component replaced with an alternative material since no material is completely resistant to erosion.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078
12	Bolting Integrity (19.2.2.9)	XI.M18	Continue the existing PSL Bolting Integrity AMP, including enhancement to: a) Ensure references to EPRI Reports 1015336, 1015337, and NUREG-1339 are added and guidance incorporated, as appropriate, for selection of bolting material and the use of lubricants and sealants. b) Ensure lubricants containing molybdenum disulfide (MoS_2) or other lubricants containing sulfur will not be used for pressure-retaining bolting.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			c) Ensure that the maximum yield strength of replacement or newly procured pressure-retaining bolting material will be limited to an actual yield strength less than 150 ksi (1,034 MPa). In addition, ensure bolting material with a yield strength greater than or equal to 150 ksi (1,034 MPa) or for which yield strength is unknown will not be used for pressure retaining bolting. For closure bolting greater than 2-inches in diameter (regardless of code classification) with actual yield strength greater than or equal to 150 ksi (1,034 MPa) or for which yield strength is unknown is used, volumetric examination will be required in accordance to that of ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1 acceptance standards, extent, and frequency of examination. d) Perform alternative means of testing and inspection for closure bolting where leakage is difficult to detect (e.g., piping systems that contain air or gas or submerged bolting). The acceptance criteria for the alternative means of testing will be no indication of leakage from the bolted connections. Required inspections will be performed on a representative sample of the population (defined as the same material and environment combination) of bolt heads and threads over each 10-year period of the SPEO. The representative sample will be 20% of the population (up to a maximum of 19 per unit). The alternative testing will be completed on a case-by-case basis through: • Visual inspections of closure bolting during maintenance activities that make the bolt heads accessible and bolt threads visible; • Visual inspection for discoloration is conducted when leakage of the environment inside the piping systems would discolor the external surfaces; • Monitoring and trending of pressure decay is performed when the bolted connection is located within an isolated boundary; • Soap bubble testing, or; • Thermography testing when the temperature of the fluid is higher than ambient conditions. e) Ensure that bolted joints that are not readily visible during plant operations and refueling outages will be inspected when they are made accessible and at such intervals that would provide reasonable assurance the components’ intended functions are maintained.		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			f) Ensure that closure bolting inspections will include consideration of the guidance applicable for pressure boundary bolting in NUREG-1339 and in EPRI NP-5769. g) Project, where practical, identified degradation until the next scheduled inspection. Results will be evaluated against acceptance criteria to confirm that the timing of subsequent inspections will maintain the components' intended functions throughout the SPEO based on the projected rate of degradation. For sampling-based inspections, results will be evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the SPEO operation based on the projected rate and extent of degradation. Adverse results will be evaluated to determine if an increased sample size or inspection frequency is required. h) Evaluate leakage monitoring and sample expansion and add additional inspections if inspection results do not meet acceptance criteria as described in NUREG-2191, Chapter XI.M18, Element 7.		
13	Steam Generators (19.2.2.10)	XI.M19	a) Continue the existing PSL Steam Generators AMP.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202 RAI Response Set 2 ML22192A078 RAI Response Set 3 ML22221A134 SLRA Supplement 5 ML23165A114
14	Open-Cycle Cooling Water System (19.2.2.11)	XI.M20	Continue the existing PSL Open-Cycle Cooling Water System AMP, including enhancement to: a) Ensure program tests and inspections follow site procedures that include requirements for items such as lighting, distance offset, surface coverage, presence of protective coatings, and cleaning processes.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO i.e.:	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			b) Ensure the primary program document and applicable procedures and preventive maintenance activities include trending of wall thickness measurements at locations susceptible to ongoing degradation due to specific aging mechanisms (e.g., MIC). The PSL Open-Cycle Cooling Water System AMP will adjust the monitoring frequency based on the trending. c) Ensure the primary program document and applicable procedures and preventive maintenance activities clarify that when components do not meet or are projected to not meet the next inspection's minimum wall thickness requirements, the program includes reevaluation, repair, or replacement such components. d) Ensure that all above-ground, main line and strainer bypass line, safety-related ICW piping is replaced with AL6XN stainless steel piping. e) Clarify within the applicable procedures, specifications, and preventive maintenance activities that the 100% internal inspections of the ICW header piping will be supplemented with localized volumetric examinations (UT, radiography, etc.) as applicable for areas where visual inspection alone is not adequate or as needed to determine the extent of degradation.	PSL1: 09/01/2035	
15	Closed Treated Water Systems (19.2.2.12)	XI.M21A	Continue the existing PSL Closed Treated Water Systems AMP, including enhancement to: a) Ensure that the new visual inspection procedure(s) and/or preventive maintenance requirements evaluate the visual appearance of surfaces for evidence of loss of material on the internal surfaces exposed to the treated closed recirculating cooling water. b) Create new procedure(s) and/or preventive maintenance requirements that perform surface or volumetric examinations and evaluate the examination results for surface discontinuities indicative of cracking on the internal surfaces exposed to the treated closed recirculating cooling water. c) Ensure that visual inspections of closed treated water system components' internal surfaces are conducted whenever the system boundary is opened. When opportunistic visual inspections are conducted while the system boundary is open, they can be credited towards the representative samples for the loss of material and fouling;	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			however, surface, or volumetric examinations must be used to confirm that there is no cracking. d) Create new procedure(s) and/or preventive maintenance requirements to ensure that the inspection requirements from NUREG-2191 are met. At a minimum, in each 10-year period during the SPEO, a representative sample of components is inspected using techniques capable of detecting loss of material, cracking, and fouling, as appropriate. The sample population is defined as follows: • 20% of the population (defined as components having the same material, water treatment program, and aging effect combination) OR; • A maximum of 19 components per population at each Unit since PSL is a two-Unit plant. e) Ensure that the new inspection and test procedure(s) and/or preventive maintenance requirements will evaluate their respective results against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the SPEO based on the projected rate and extent of degradation. Where practical, identified degradation is projected through the next scheduled inspection. f) Ensure that the new inspection and test procedure(s) and/or preventive maintenance requirements report and evaluate any detectable loss of material, cracking, or fouling associated with the surfaces exposed to the treated closed recirculating cooling water per the PSL corrective action program. g) Ensure that the following additional inspections and actions are required if a post-repair/replacement inspection or subsequent inspection of surfaces exposed to the treated closed cooling water environment fails to meet acceptance criteria: • The number of increased inspections is determined in accordance with the PSL corrective action process; however, there are no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20% of each applicable material, environment, and aging effect combination is inspected, whichever is less. • If subsequent inspections do not meet acceptance criteria, an extent-of-condition and extent-of-cause analysis is conducted to determine the further extent of inspections.		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			• Additional samples are inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. Since PSL is a two-Unit site, the additional inspections include inspections at both Units with the same material, environment, and aging effect combination. • The additional inspections are completed within the interval (e.g., refueling outage interval, 10-year inspection interval) in which the original inspection was conducted.		
16	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (19.2.2.13)	XI.M23	Continue the existing PSL Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP, including enhancement to: a) Update the implementing procedure to state that, for the in-scope systems that are infrequently in service, such as the containment polar cranes, periodic inspections are performed once every refueling cycle just prior to use. b) Update the implementing procedure and inspection procedures to state their respective visual inspection frequencies required by ASME B30.2-2005. According to ASME B30.2-2005, inspections are performed within the following intervals: • “Periodic” visual inspections by a designated person are required and documented yearly for normal service applications • A crane that is used in infrequent service, which has been idle for a period of one year or more, shall be inspected before being placed in service in accordance with the requirements listed in ASME B30.2-2005 paragraph 2-2.1.3 (i.e., periodic inspection) c) Update the implementing procedure to ensure that the inspection procedures for the individual load handling systems are clearly identified and referenced. d) Update the governing procedure to state that any visual indication of loss of material, deformation, or cracking, and any visual sign of loss of bolting preload for NUREG 0612 load handling systems is evaluated according to ASME B30.2-2005. e) Update the governing procedure to state that repairs made to NUREG-0612 load handling systems are performed as specified in ASME B30.2-2005.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
17	Compressed Air Monitoring (19.2.2.14)	XI.M24	Continue the existing PSL Compressed Air Monitoring AMP, including enhancement to formalize compressed air monitoring activities in a new governing procedure addressing the element by element requirements presented in NUREG-2191 Section XI.M24. The following enhancements are also to be included into this procedure and other pertinent documents: a) Incorporate the air quality provisions provided in the guidance of the EPRI TR-108147 and consider the related guidance in the ASME OM-2012, Division 2, Part 28. b) Perform opportunistic visual inspections of accessible internal surfaces for signs of corrosion and abnormal corrosion products that might indicate a loss of material within the system. c) Include inspections of internal air line surfaces downstream of the instrument air dryers and emergency diesel generator air start dryers with maintenance, corrective, or other activities that involve opening of the component or system. d) Include inspection methods for the opportunistic inspections with guidance of standards or documents such as ASME OM-2012, Division 2, Part 28. e) Review air quality test results. f) Include requirements for better long-term trending of negative trends, more thorough documentation, and proactive aging management. g) Include monitoring and trending guidance from ASME OM-2012, Division 2, Part 28 as applicable.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078
18	Fire Protection (19.2.2.15)	XI.M26	Continue the existing PSL Fire Protection AMP, including enhancement to: a) Enhance plant procedures to specify that penetration seals will be inspected for indications of increased hardness and loss of strength such as cracking, seal separation from walls and components, separation of layers of material, rupture, and puncture of seals. Inspections will be acceptable if there are no significant indications of cracking and loss of material that could result in the loss of the fire protection capability. b) Enhance plant procedures to specify that subliming, cementitious, and silicate materials used in fireproofing and fire barriers will be inspected for loss of material, separation, change in material properties, and cracking/delamination. Inspections will be acceptable if there are no	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202 RAI Response Set 2 ML22192A078

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			significant indications of cracking and loss of material that could result in the loss of the fire protection capability. c) Enhance plant procedures to specify that any loss of material (e.g., general, pitting, or crevice corrosion) to the fire damper housings assembly is unacceptable. d) Enhance plant procedures to require projection of identified degradation to the next scheduled inspection for all monitored fire protection SSCs, where practical. e) Enhance plant procedures to require that projections are evaluated against acceptance criteria to confirm that the timing of subsequent inspections will maintain the components' intended functions throughout the subsequent period of extended operation based on the projected rate of degradation. f) Enhance plant procedures to specify that: • Holes in fire doors should be filled with steel sheet metal screws or through-bolts. • Steel conduits which have been attached to fire door frames with proper fittings are considered acceptable provided the conduit does not pass completely through the frame. • Flexible steel conduit (with or without water resistant coatings) may be attached to fire door frames for security contacts and latches. They must be attached with steel hardware (sheet metal screws, through bolts, etc.). • Holes in one surface of fire doors or frames larger than that capable of being filled by sheet-metal screws and not larger than typical conduit penetrations may be covered by a 16 gauge steel plate which overlaps the hole on all sides. The plate should be attached with steel sheet-metal screws or may be welded.		
19	Fire Water System (19.2.2.16)	XI.M27	Continue the existing PSL Fire Water System AMP, including enhancement to: a) Update the governing AMP procedure to clearly state which procedures perform visual inspections for detecting loss of material, as well as state which procedures perform surface examinations or ASME Code, Section XI, VT-1 visual examinations for identifying SCC of copper alloy (>15% Zn) valve bodies, nozzles, and strainers. Such visual inspections will	Program is implemented and inspections or tests begin 5 years before the	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202

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			require using an inspection technique capable of detecting surface irregularities that could indicate an unexpected level of degradation due to corrosion and corrosion product deposition. Where such irregularities are detected, follow-up volumetric wall thickness examinations shall be performed. The internal inspections will be performed during the periodic system and component surveillances or during the performance of maintenance activities when the surfaces are made accessible for visual inspection. At a minimum, in each 10-year period during the SPEO, a representative sample of 20% of the population (defined as components having the same combination of material, environment, and aging effect) or a maximum of 19 components per population at each Unit is inspected. Where practical, the inspections will focus on the bounding or lead components most susceptible to aging. b) Update the governing AMP procedure to clearly state which procedures perform volumetric wall thickness inspections. Volumetric inspections shall be conducted on the portions of the water-based fire protection system components that are periodically subjected to flow but are normally dry. c) Update existing inspection/testing procedures and create new procedures to incorporate the surveillance requirements stated in NUREG-2191, Section XI.M27, Element 4 and Table XI.M27-1, which are based on NFPA 25, 2011 edition. This includes testing or replacement of fast-response and traditional sprinkler heads that have been in service for 20 or 50 years, respectively, in accordance with NFPA 25. d) Update the governing AMP procedure and trending procedure to state that where practical, degradation identified is projected until the next scheduled inspection. Results will be evaluated against acceptance criteria to confirm that the timing of subsequent inspections will maintain the components' intended functions throughout the SPEO based on the projected rate of degradation. Results of flow testing (e.g., buried, and underground piping, fire mains, and sprinklers/spray nozzles), flushes, and wall thickness measurements are monitored and trended by either the Engineering or the Fire Protection Department per instructions of the specific test/inspection procedure. Degradation identified by flow testing, flushes, and inspections is evaluated. If the condition of the piping/component does not meet acceptance criteria, then a condition report is written per the PSL corrective action program and the component is evaluated for repair/replacement. For sampling-based	SPEO (i.e., 03/01/2031). Inspections or tests that are to be completed prior to the SPEO are completed 6 months prior to the SPEO (i.e., 09/01/2035) or no later than the last refueling outage prior to the SPEO. Inspections of the City Water Storage Tank bottoms begin 10 years before the SPEO (i.e., 03/01/2026).	RAI Response Set 2 ML22192A078

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			inspections, results are evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the SPEO based on the projected rate and extent of degradation. e) Update the governing AMP procedure to identify the procedure that performs the continuous monitoring and evaluation of the fire water system discharge pressure. f) Update the governing AMP procedure to state that results of flow testing (e.g., buried, and underground piping, fire mains, and sprinkler), flushes, and wall thickness measurements are monitored and trended. Degradation identified by flow testing, flushes, and inspections is evaluated. g) Update spray and sprinkler system flushing procedures to enable trending of data. Specifically, the existing flushing procedures (listed below) will be revised to document and trend deposits (scale or foreign material). Recommended methods for trending deposits may include the following as feasible: • Inspectors will take photographs of deposits. • Inspectors will measure the weight of the deposits. • Inspectors will measure elapsed time taken to complete a flush (i.e., the time required for the flushing water to turn an acceptable color). The documentation above will be maintained by the AMP owner for comparing and trending inspection/test results. Existing flushing procedures (listed below), as well as new flushing procedures, will include steps to compare the amount of deposits to the previous inspections' results, and if the trend is negative or if the projected solids for the next inspection/test/flush are anticipated to exceed an acceptable amount that would impact the system intended function, then the PSL corrective action program will be utilized to drive improvement. Additionally, identified deposits will be evaluated for potential impact on downstream components, such as sprinkler heads or spray nozzles. h) Update the governing AMP procedure to state that identified wall loss greater than the manufacturers tolerance will be entered into the corrective action program process for engineering evaluation.		

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			i) Update the governing AMP procedure to point to the inspection procedures which inspect the wall thicknesses and compare wall loss to the manufacturers tolerance. j) Update the governing AMP procedure to state that internal inspection, flow testing, and flushing procedures/ preventive maintenance activities must demonstrate that no loose fouling products exist in the systems that could cause flow blockage in the sprinklers or deluge nozzles. k) Update the governing AMP procedure and respective pipe inspection procedures to state that if an obstruction inside piping or sprinklers is detected during pipe inspections, the material is removed and the inspection results are entered into the PSL corrective action program for further evaluation. An evaluation is conducted to determine if deposits need to be removed to determine if loss of material has occurred. When loose fouling products that could cause flow blockage in the sprinklers is detected, a flush is conducted in accordance with the guidance in NFPA 25 Annex D.5, “Flushing Procedures.” If any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection, inspection frequencies are adjusted as determined by the PSL corrective action program. If a failure occurs (e.g., a through-wall leak or blockage impacting operability), the failure mechanism shall be identified and used to determine the most susceptible system locations for additional inspections, including consideration to the other Unit systems as driven by the corrective action program. When piping is replaced prior to failure, due to concerns with wall thinning or blockage, inspections are considered for similar areas of the system to determine the presence and extent of degradation. The implementation of these augmented inspection actions provides reasonable assurance that the fire water system will continue to perform its function adequately through the SPEO. l) Update the existing flow test procedure and the existing deluge system flush/test procedure enhanced with new main drain tests to state that if a flow test or a main drain test does not meet acceptance criteria due to current or projected degradation, then additional tests will be conducted. The number of increased tests is determined in accordance with the PSL corrective action program; however, there are no fewer than two additional tests for each test that did not meet acceptance criteria. The additional inspections are completed within the interval (i.e., 5 years, annual) in which the original test was conducted. If subsequent tests do not meet acceptance criteria, an extent-of-condition and extent-of-cause		

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			analysis will be conducted to determine the further extent of tests. Since PSL is a two-Unit site, additional tests include inspections at both of the Units with the same material, environment, and aging effect combination. m) Update the primary program procedure and applicable preventive maintenance activities to state that, as a contingency, if degradation mechanisms such as MIC, erosion, or recurring loss of material due to internal corrosion were to occur, the frequency and extent of wall thickness inspections are increased commensurate with the significance of the degradation. The number of increased inspections is determined in accordance with the PSL corrective action program; however, no fewer than five additional inspections are conducted for each inspection that did not meet acceptance criteria, or 20% of each applicable material, environment, and aging effect combination is inspected, whichever is less. Since PSL is a two Unit site, the additional inspections include inspections of components with the same material, environment, and aging effect combination at the opposite unit. The additional inspections will occur at least every 24 months until the rate of recurring internal corrosion occurrences no longer meets the criteria for "loss of material due to recurring internal corrosion" as defined in NUREG 2192. The selected inspection locations will be periodically reviewed to validate their relevance and usefulness and adjusted as appropriate. Evaluation of the inspection results will include (1) a comparison to the nominal wall thickness or previous wall thickness measurements to determine rate of corrosion degradation; (2) a comparison to the design minimum allowable wall thickness to determine the acceptability of the component for continued use; and (3) a determination of reinspection interval.		
20	Outdoor and Large Atmospheric Metallic Storage Tanks (19.2.2.17)	XI.M29	Continue the existing PSL Outdoor and Large Atmospheric Metallic Storage Tanks AMP, including enhancement to: a) Create a new procedure, and/or associated preventive maintenance activities, to: • Address the interfaces, handoffs, and overlaps between the PSL Outdoor and Large Atmospheric Metallic Storage Tanks AMP and the following AMPs: o PSL Structures Monitoring AMP;	Program inspections or tests begin 10 years before the SPEO. One-time inspections begin 5 years prior to the SPEO. Inspections or tests that are to be completed prior to	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202 RAI Response Set 3 ML22221A134

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			○ PSL External Surfaces Monitoring of Mechanical Components AMP; ○ PSL Water Chemistry AMP; ○ PSL Fuel Oil Chemistry AMP; ○ PSL One-Time Inspection AMP; ○ PSL Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP; and ○ PSL ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP. • Direct periodic (18-month interval) visual inspection of tank-to-concrete caulking/sealants, with mechanical manipulation as appropriate. Update or reactivate existing caulking/sealant inspection preventive maintenance activities and create new caulking/sealant inspection preventive maintenance activities as needed. These caulking/sealant inspections are performed by the PSL Structures Monitoring AMP. • Direct the 10-year bottom thickness measurement of the TWST, DOST 1A, DOST 1B, and the U1 CST, using low-frequency electromagnetic testing (LFET) techniques with follow-on UT examination, as necessary, at discrete tank locations identified by LFET. • Direct baseline one-time interior visual inspections of the U1 RWT. Direct 10-year surface examination inspections of the aluminum U1 RWT's interior nonwetted surface and exterior surface for evidence of loss of material and cracking. The surface examinations will inspect 25 1-square-foot sections or 25 1-linear-foot sections of welds. If evidence of cracking is identified, then a surface examination is also performed to determine the extent of the cracking. • Clarify that subsequent inspections are conducted in different locations unless this AMP includes a documented basis for conducting repeated volumetric and surface inspections in the same location.	the SPEO are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO. Program and SLR enhancements are implemented 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	

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			• Clarify that inspections and tests are performed by personnel qualified in accordance with site procedures to perform the specified task. • Clarify that inspections and tests within the scope of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) follow procedures consistent with the ASME Code, including ASME Code Section XI. Non-ASME Code inspections and tests follow site procedures that include considerations such as lighting, distance offset, surface coverage, presence of protective coatings, and cleaning processes. • Clarify that where practical, identified degradation is projected until the next scheduled inspection, or in the case of one-time inspections, identified degradation is projected to the end of the SPEO. • Clarify that results are evaluated against acceptance criteria to confirm or adjust timing of subsequent inspections, or in the case of one-time inspections, schedule follow-up inspections. • State the acceptance criteria as follows: o No degradation of paints or coatings (e.g., cracking, flakes, or peeling); o No non-pliable, cracked, or missing caulking/sealant for the tank bottom interface; o No indications of cracking of the aluminum walls and ceiling of the U1 RWT, and; o Measured or projected tank bottom thickness must be greater than 87.5% of the nominal plate thickness. (Not applicable to the U1 RWT) • State the appropriate corrective actions to perform for when degradation (e.g., sealant/caulking flaws, paint/coating flaws, loss of material, cracking, etc.) is identified, which include the following: o Report degradation via a condition report (CR) then perform an engineering evaluation or repair/replace the degraded component as needed.		

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			o Repair or replace the degraded component as determined by engineering evaluation and perform follow-up examinations. For one-time inspections that do not meet acceptance criteria, inspections are subsequently conducted at least at 10-year inspection intervals. o Expand the inspection to include all tanks of with the same material-environment combination (for DOST degradation). o For other sampling-based inspections (e.g., 20%, 25 locations) the smaller of five additional inspections or 20% of the inspection population is conducted. If subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause is conducted to determine the further extent of inspection. The additional inspections include inspections at all of the Units with the same material, environment, and aging effect combination. Sample expansion inspections that happen in the next inspection interval are part of the preceding interval. b) Perform baseline one-time interior visual inspections of the U1 RWT. Perform 10-year surface examination inspections of the aluminum U1 RWT's interior nonwetted surface and exterior surface for evidence of loss of material and cracking. The surface examinations will inspect 25 1-square-foot sections or 25 1-linear-foot sections of welds. If evidence of cracking is identified, then a surface examination is also performed to determine the extent of the cracking. c) Perform 10-year LFET tank bottom thickness examinations of the TWST, DOST 1A, DOST 1B, and the U1 CST, with follow-on UT at discrete locations. d) Perform visual inspections of the U1 RWT floor, in lieu of volumetric examinations, to inspect for cracking and loss of material as prescribed in an NRC-approved ASME Section XI Inservice Inspection relief request documented in FPL engineering evaluations and preventive maintenance activities. The preventive maintenance activities include a full hands-on drained tank interior inspection performed using the methods directed by the relief request at the frequency prescribed by the NRC approved relief request for each respective ASME Section XI ISI interval. The drained tank inspection will also inspect for galvanic corrosion cells between the stainless steel piping, and manway flanges		

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			and the aluminum tank. For a refueling outage where a hands-on inspection is not scheduled, a remote visual inspection of the RWT liner will be performed. As an option, the remote visual inspections may be performed with the unit on-line.		
21	Fuel Oil Chemistry (19.2.2.18)	XI.M30	Continue the existing PSL Fuel Oil Chemistry AMP, including enhancement to: a) Address the analysis of stored fuels in the day tanks describing analytical techniques and test frequencies for determining water and sediment content, total particulate concentration, and microbiological contamination levels. b) Address periodic tank cleaning, and visual or alternative internal inspections of the day tanks. c) Drain, clean, and visually inspect all DOSTs at least once during the 10-year period prior to the SPEO, and repeat the inspection at least once every 10 years. d) Require any pressure retaining boundary degradation identified during visual inspection be supplemented with volumetric (UT) wall thickness testing including bottom thickness measurements for the DOSTs if warranted. e) Prior to the SPEO, perform a one-time inspection of selected components exposed to diesel fuel oil in accordance with the PSL One-Time Inspection AMP to verify the effectiveness of the PSL Fuel Oil Chemistry AMP. f) Enhance monitoring and trending by: • Perform periodic fuel oil sampling of the day tanks. • Clarify that the sampling specifically monitors the following parameters for trending purposes: water content, sediment content, biological activity, and total particulate concentration for all DOSTs and day tanks. • Update frequency of ASTM D975 analysis to quarterly. g) Include the following monitoring and trending features in visual and volumetric inspection methodology: • Identified degradation is projected until the next scheduled inspection, where practical.	Program inspections begin 10 years before the SPEO. Inspections that are to be completed prior to the SPEO are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO. Program and SLR enhancements are implemented 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202

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			• Evaluate the results against acceptance criteria to confirm that the timing of subsequent inspections will maintain the components' intended functions throughout the SPEO based on the projected rate of degradation. h) Provide acceptance criteria, consistent with industry standards, for the testing requirement and approach used to detect the presence of water, particulates, and microbiological activity in stored diesel fuel within all DOSTs and day tanks. i) Include the following acceptance criteria features in visual and volumetric inspection methodology: • Report any degradation of the tank (including all DOSTs and day tanks) internal surfaces and evaluate using the corrective action program. • Evaluate thickness measurements of the DOST tank bottom against the design thickness and corrosion allowance. j) Provide corrective actions, such as addition of a biocide, to be taken should testing detect the presence of microbiological activity in stored diesel fuel. k) Address performing corrective actions to prevent recurrence when the specified limits for fuel oil standards are exceeded during periodic surveillance. l) Update procedures/PMRQs to perform bottom sampling of the DOSTs before and after the respective tanks' recirculation.		
22	Reactor Vessel Material Surveillance (19.2.2.19)	XI.M31	Continue the existing PSL Reactor Vessel Material Surveillance AMP, including an incremental adjustment to the approved capsule withdrawal schedule to withdraw and test the surveillance capsules located at 263° and 83° in accordance with the NRC approved withdrawal schedule.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202 RAI Response Set 2 ML22192A078
23	One Time inspection (19.2.2.20)	XI.M32	a) Implement the new PSL One-Time Inspection AMP. The new AMP will include volumetric examinations consistent with Table XI.M32-1 of NUREG-2191 XI.M32 One-Time Inspection program to examine the	Program inspections begin 10 years before the SPEO.	SLRA Rev. 1 ML21285A110

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			PSL Unit 2 EDG heat exchanger (radiator tubes) for the loss of material and cracking aging effects.	Inspections that are to be completed prior to the SPEO are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO. Program and SLR enhancements are implemented 6 months prior to the SPEO, i.e.: PSL2: 10/06/2042	SLRA Supplement 1 ML22097A202 SLRA Supplement 6 ML23194A211
24	Selective Leaching (19.2.2.21)	XI.M33	Implement the new PSL Selective Leaching AMP, including the following additional action: a) To confirm that loss of material due to selective leaching is an aging effect unique to the external surfaces of the Unit 1 EDG copper alloy with greater than 15 percent zinc radiator tubes, PSL will perform a one-time inspection of a representative sample of Unit 1 and 2 copper alloy with greater than 15 percent zinc components exposed to an air-outdoor external and air-outdoor internal environments, as applicable, prior to the SPEO. This inspection will be performed in accordance with the Selective Leaching AMP and will be considered a separate inspection population.	Program inspections begin 10 years before the SPEO. Inspections that are to be completed prior to the SPEO are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO. Program and SLR enhancements are implemented 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202 RAI Response Set 4 Rev. 1 ML23111A129 SLRA Supplement 5 ML23165A114
25	ASME Code Class 1 Small-Bore Piping (19.2.2.22)	XI.M35	Continue the existing PSL ASME Code Class 1 Small-Bore Piping AMP, which includes:	Program inspections are completed within 6 years before the	SLRA Rev. 1 ML21285A110

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			a) Perform one-time inspection of small-bore piping using the methods, frequencies, and acceptance criteria as outlined in NUREG-2191, Section XI.M35. b) Evaluate the results to determine if additional or periodic inspections are required and perform any required additional inspections.	SPEO. Inspections that are to be completed prior to the SPEO are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO. Program and SLR enhancements are implemented 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Supplement 1 ML22097A202
26	External Surfaces Monitoring of Mechanical Components (19.2.2.23)	XI.M36	Continue the existing PSL External Surfaces Monitoring of Mechanical Components AMP, including enhancement to: a) Indicate the material and environment combinations where external examinations could be credited to manage the aging effects of the internal surfaces of components as detailed in the PSL External Surfaces Monitoring of Mechanical Components AMP. b) Incorporate the aging management activities currently performed for external corrosion of insulated piping at PSL in the PSL External Surfaces Monitoring of Mechanical Components program procedure. c) Ensure all components made of stainless steel, aluminum, or copper alloys with greater than 15% Zn or 8% Al inspected by this program will have periodic visual or surface examinations conducted to manage cracking. d) Monitor the aging effects for elastomeric and flexible polymeric components through a combination of visual inspection and manual or physical manipulation of the material. Manual or physical manipulation of the material will include touching, pressing on, flexing, bending, or otherwise manually interacting with the material. The purpose of the manual manipulation will be to reveal changes in material properties, such as hardness, and to make the visual examination process more effective in identifying aging effects such as cracking. Flexing of polymeric components (e.g., expansion joints) exposed directly to	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 1 ML22164A802 RAI Response Set 2 ML22192A078

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			sunlight (i.e., not located in a structure restricting access to sunlight such as manholes, enclosures, and vaults or isolated from the environment by coatings) will be conducted to detect potential reduction in impact strength as indicated by a crackling sound or surface cracks when flexed. Examples of inspection parameters for elastomers and polymers will include: • Surface cracking, crazing, scuffing, and dimensional change (e.g., “ballooning” and “necking”), • Loss of thickness, • Discoloration (evidence of a potential change in material properties that could be indicative of polymeric degradation), • Exposure of internal reinforcement for reinforced elastomers, • Hardening as evidenced by a loss of suppleness during manipulation where the component and material are appropriate to manipulation. e) Specify that this program will also manage hardening or loss of strength, loss of preload for heating, ventilation, and air conditioning (HVAC) closure bolting, and blistering using visual inspections. In addition, physical manipulation will be used to manage hardening or loss of strength and reduction in impact strength. f) Specify that, when required by the ASME Code, inspections will be conducted in accordance with the applicable code requirements. And, when non-ASME Code inspections and tests are required, inspections will follow site procedures that include inspection parameters for items such as lighting, distance, offset, surface coverage, and presence of protective coatings. Inspections, except those for cracking and under insulation, will be performed every refueling outage. g) Ensure that periodic visual inspections or surface examinations will be conducted on components made of stainless steel, aluminum, or copper alloys with greater than 15% Zn or 8% Al to manage cracking every 10 years during the SPEO and other inspections will be performed at a frequency not to exceed one refueling cycle. Surfaces that are not readily visible during plant operations and refueling outages are inspected when they are made accessible and at such intervals that		

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			would provide reasonable assurance that the components' intended functions are maintained. h) Specify that, when inspecting to manage cracking of a component's material, either surface examinations conducted in accordance with plant-specific procedures or ASME Code Section XI VT-1 inspections (including those inspections conducted on non-ASME Code components) are conducted on each component inspected. An inspection requires that at least 20% of the surface area of the component is inspected, unless the component is measured in linear feet, such as piping. Any combination of 1-ft length sections and components can be used to meet the recommended extent of 20% of the population of materials and environment combinations, with a maximum of 25 inspections required in each population. An inspection of a component in a more severe environment may be credited as an inspection for the specified environment and for the same material and aging effects in a less severe environment (e.g., an outdoor air environment is more severe than an indoor uncontrolled air environment which is more severe than an indoor controlled air environment, assuming that there are no borated water leaks in the indoor environments). i) Specify that, when inspecting insulated components in an outdoor environment or that may be exposed to condensation in an indoor environment, that the population and sample sizes used for inspections will be determined based on the material type (e.g., steel, stainless steel, copper alloy, aluminum) and environment (e.g., air outdoor, air accompanied by leakage) combination. A minimum of 20% of the in-scope piping length, or 20% of the surface area for components whose configuration does not conform to a 1-ft axial length determination (e.g., valve, accumulator, tank) is inspected after the insulation is removed. Alternatively, any combination of a minimum of twenty-five 1-ft axial length sections and components for each material type is inspected, with a maximum of 25 inspections required in each population. j) Ensure that visual inspections identify indirect indicators of elastomer and flexible polymer hardening or loss of strength, including the presence of surface cracking, crazing, discoloration, and, for elastomers with internal reinforcement, the exposure of reinforcing fibers, mesh, or underlying metal. Visual inspections will cover 100% of accessible component surfaces. Visual inspection will identify direct indicators of loss of material due to wear to include dimension change, scuffing, and,		

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			for flexible polymeric materials with internal reinforcement, the exposure of reinforcing fibers, mesh, or underlying metal. Manual or physical manipulation can be used to augment visual inspection to confirm the absence of hardening or loss of strength for elastomers and flexible polymeric materials (e.g., heating, ventilation, and air conditioning flexible connectors) where appropriate. The sample size for manipulation will be at least 10% of available surface area. k) Indicate that the following alternatives to removing insulation after the initial inspection will be acceptable: i. Subsequent inspections may consist of examination of the exterior surface of the insulation with sufficient acuity to detect indications of damage to the jacketing or protective outer layer (if the protective outer layer is waterproof) of the insulation when the results of the initial inspections meet the following criteria: • No loss of material due to general, pitting, or crevice corrosion beyond that which could have been present during initial construction is observed during the first set of inspections, and • No evidence of SCC is observed during the first set of inspections. If: (a) the external visual inspections of the insulation reveal damage to the exterior surface of the insulation or jacketing, (b) there is evidence of water intrusion through the insulation (e.g., water seepage through insulation seams/joints), or (c) the protective outer layer (where jacketing is not installed) is not waterproof, then periodic inspections under the insulation should continue as conducted for the initial inspection. ii. Removal of tightly adhering insulation that is impermeable to moisture is not required unless there is evidence of damage to the moisture barrier. If the moisture barrier is intact, the likelihood of corrosion under insulation is low for tightly adhering insulation. Tightly adhering insulation is considered to be a separate population from the remainder of insulation installed on in-scope components. The entire population of in-scope piping that has tightly adhering insulation is visually inspected for damage to the moisture barrier with the same frequency as for other types of		

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			insulation inspections. These inspections are not credited towards the inspection quantities for other types of insulation. l) Specify that results are evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the SPEO based on the projected rate and extent of degradation. m) Include evaluation and acceptance guidance from EPRI TR-1009743, "Aging Identification and Assessment Checklist," for visual/tactile inspections where appropriate. n) Specify that inspections to detect cracking in aluminum, stainless steel, and applicable copper alloy components will have additional inspections conducted if one of the inspections does not meet the acceptance criteria due to current or projected degradation (i.e., trending) unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement for all components constructed of the same material and exposed to the same environment. The number of increased inspections will be determined in accordance with the site's corrective action process; however, there will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20% of each applicable material, environment, and aging effect combination is inspected, whichever is less. The additional inspections are completed within the interval in which the original inspection was conducted. If subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause analysis will be conducted to determine the further extent of inspections. Additional samples will be inspected for any recurring degradation to provide reasonable assurance that corrective actions appropriately address the associated causes. The additional inspections include populations with the same material, environment, and aging effect combinations at both Unit 1 and Unit 2. o) Require that any projected inspection results that will not meet acceptance criteria prior to the next scheduled inspection, will have their inspection frequencies adjusted as determined by the corrective action program. p) Revise walkdown inspection forms to identify new requirements and components to be inspected.		

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27	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (19.2.2.24)	XI.M38	Implement the new PSL Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078
28	Lubricating Oil Analysis (19.2.2.25)	XI.M39	Continue the existing PSL Lubricating Oil Analysis AMP, including enhancement to: a) Perform sampling and testing of old oil following periodic oil changes or on a schedule consistent with equipment manufacturer's recommendations or industry standards [e.g., ASTM D6224-02]. Plant specific OE associated with oil systems may also be used to adjust the schedule for periodic sampling and testing, when justified by prior sampling results. b) Ensure guidance indicates that phase-separated water in any amount is not acceptable. If phase-separated water is identified in the sample, then corrective actions are to be initiated to identify the source and correct the issue (e.g., repair/replace component or modify operating conditions).	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078
29	Monitoring of Neutron-Absorbing Materials Other Than Boraflex (19.2.2.26)	XI.M40	Continue the existing PSL Monitoring of Neutron-Absorbing Materials Other Than Boraflex AMP, including enhancement to: a) Inspect and test Metamic® inserts on a frequency dependent on the condition of the neutron-absorbing material and determined and justified with PSL-specific OE. For each Metamic® insert selected for surveillance, the maximum interval between each inspection and between each coupon test is not to exceed 10 years, regardless of OE; b) Compare observations and measurements from the periodic inspections and coupon testing to baseline information or prior measurements and analyses for trending analysis, projecting future degradation, and projecting the future subcriticality margin of the spent fuel pool (SFP). This trending will also consider differences in exposure conditions, venting, spent fuel rack differences, etc. for each Metamic® insert or coupon selected for surveillance. c) Initiate corrective actions (e.g., add neutron-absorbing capacity with an alternate material, or apply other available options) to maintain the subcriticality margin if the results from measurements and analysis indicate that the 5% subcriticality margin cannot be maintained because of current or projected degradation of the neutron-absorbing material.	Complete the initial Boral® testing and inspections no later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110

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			d) Manage aging effects associated with the Boral® panels in the SFP cask area by monitoring for loss of material and changes in dimension that could result in loss of neutron-absorbing capability of the Boral® panels. Monitor parameters associated with the physical condition of the Boral® panels and include in-situ gap formation, geometric changes as observed from coupons or in situ, and decreased boron-10 areal density, etc. The parameters monitored are directly related to determination of the loss of material or loss of neutron absorption capability of the Boral® panels. These parameters are monitored using coupon and/or direct in-situ testing of the Boral® panels to identify their associated loss of material and degradation of neutron-absorbing capacity. The frequency of the inspection and testing depends on the condition of the neutron-absorbing material and is determined with site-specific OE; however, the maximum interval between these inspections is not to exceed 10 years, regardless of OE. Compare the Boral® inspection and testing measurements to baseline values for trending analysis and projecting future panel degradation and SFP subcriticality margins. The degradation trending must be based on samples that adequately represent the entire Boral® panel population, and the trending must consider differences in sample exposure conditions, differences in spent fuel cask racks, and possibly other considerations. The new Boral® panel surveillance acceptance criteria for the obtained inspection, testing, and analysis measurements must ensure that the 5% subcriticality margin for the SFP will be maintained, otherwise corrective actions need to be implemented.		
30	Buried and Underground Piping and Tanks (19.2.2.27)	XI.M41	Implement the new PSL Buried and Underground Piping and Tanks AMP. a) Install cathodic protection systems and perform effectiveness reviews in accordance with Table XI.M41-2 in NUREG-2191, Section XI.M41. b) If after five years of operation the cathodic protection system does not meet the effectiveness acceptance criteria defined by NUREG-2191, Tables XI.M41-2 and -3 (-850 mV relative to a CSE, instant off, for at least 80% of the time, and in operation for at least 85% of the time), FPL commits to performing two additional buried steel piping inspections beyond the number required by Preventive Action Category F resulting in a total of 13 inspections being completed 6 months prior to the SPEO. The cathodic protection criterion listed above will continue to be used after five years through the end of the SPEO. c) Perform periodic pressure testing and blow-out testing (purging) with air or nitrogen of the annular volume between the underground stainless	Program inspections begin 10 years before the SPEO. Inspections that are to be completed prior to the SPEO are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO.	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202

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			steel fuel oil piping and its respective guard piping to verify no leakage of guard pipe and no leakage from the fuel oil piping. This testing will be performed for at least 25 percent of the stainless steel fuel oil piping housed within guard piping at an interval not to exceed 5 years with the first occurrence prior to the SPEO. The annular volume between the fuel oil piping and guard piping will be pressurized to 110 percent of the design pressure of any component within the boundary (not to exceed the maximum allowable test pressure of any non-isolated components) with test pressure being held for a continuous eight hour interval.	Install cathodic protection systems at least 10 years before the SPEO. Program and SLR enhancements are implemented 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	
31	Internal Coatings/Linings For In-scope Piping, Piping Components, Heat Exchangers, and Tanks (19.2.2.28)	XI.M42	Implement the new PSL Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP and complete the initial inspections.	Program inspections begin 10 years before the SPEO. Inspections that are to be completed prior to the SPEO are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO. Program and SLR enhancements are implemented 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202
32	ASME Section XI, Subsection IWE (19.2.2.29)	XI.S1	Continue the existing PSL ASME Section XI, Subsection IWE AMP, including enhancement to: a) Augment existing procedures to reference EPRI Reports 1015336 and 1015337 and to incorporate guidance for proper selection of bolting material and lubricants and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high-strength bolting. Additionally, update procedures to explicitly prohibit the use of molybdenum disulfide and other lubricants containing sulfur on structural bolting.	Program one-time inspections for cracking due to SCC begin 5 years before the SPEO. Inspections that are to be completed prior to the SPEO are	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202 RAI Response Set 2 ML22192A078

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			b) Augment existing procedures to specify the use of preventive actions for storage, lubricant selection, and bolting and coating material selection discussed in Section 2 of Research Council for Structural Connections publication “Specification for Structural Joints Using High-Strength Bolts,” for structural bolting consisting of ASTM A325, ASTM A490, and equivalent bolts. c) Augment existing procedures to implement a one-time supplemental volumetric examination of containment vessel shell surfaces for both units that samples one-foot square locations including both randomly-selected and focused areas most likely to experience degradation based on OE and/or other relevant considerations such as environment if triggered by plant-specific OE after the date of issuance of the first renewed license in either unit. This sampling is conducted to demonstrate, with 95% confidence, that 95% of the accessible portion of the containment vessel shell is not experiencing greater than 10% wall loss. d) Augment existing procedures to implement supplemental one time surface examinations (magnetic particle, dye penetrant) or enhanced visual examinations (EVT 1 or equivalent), performed by qualified personnel using methods capable of detecting cracking, comprising a representative sample (ten) of the PSL Unit 1 mechanical penetration stainless steel secondary expansion bellows. Leak rate testing of the stainless steel secondary expansion bellows using the installed test fittings can be used as an alternative test method for detecting cracking. The leak rate testing will be performed using methods consistent with the 10 CFR 50, Appendix J AMP at the design pressure of 5 psig with an acceptance criteria of zero leakage. These inspections are intended to confirm the absence of SCC aging effects. If SCC is identified as a result of these inspections, the appropriate corrective action will be taken and additional surface examinations (magnetic particle, dye penetrant), enhanced visual examinations (EVT 1 or equivalent), or leak rate testing will be conducted in accordance with the site’s corrective action process. This will include testing or inspection of additional PSL Unit 1 stainless steel secondary expansion bellows until cracking is no longer detected. Periodic inspection of PSL Unit 1 stainless steel secondary expansion bellows for cracking will be added to the PSL ASME Section XI, Subsection IWE AMP if necessary, depending on the inspection results. Frequency of inspections will be consistent with the approved IWE inspection interval.	completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO. Program and SLR enhancements are implemented 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	

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33	ASME Section XI, Subsection IWF (19.2.2.30)	XI.S3	Continue the existing PSL ASME Section XI, Subsection IWF AMP, including enhancement to: a) Identify the population of ASME Class 1, 2, and 3 high-strength structural bolting greater than one-inch nominal diameter within the boundaries of IWF-1300. b) Augment existing procedures to evaluate the acceptability of inaccessible areas (e.g., portions of supports encased in concrete, buried underground, or encapsulated by guard pipe) when conditions in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. c) Augment existing procedures to reference EPRI Reports 1015336 and 1015337 and to incorporate guidance for proper selection of bolting material and lubricants and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high-strength bolting. Additionally, update procedures to explicitly prohibit the use of molybdenum disulfide and other lubricants containing sulfur on structural bolting. d) Augment existing procedures to specify the use of preventive actions for storage, lubricant selection, and bolting and coating material selection discussed in Section 2 of Research Council for Structural Connections publication “Specification for Structural Joints Using High-Strength Bolts,” for structural bolting consisting of ASTM A325, ASTM A490, and equivalent bolts. e) Augment existing procedures to specify that bolting within the scope of this program is inspected for loss of integrity of bolted connections due to self-loosening. f) Augment existing procedures to specify that accessible sliding surfaces are monitored for significant loss of material due to wear and accumulation of debris or dirt. g) Perform and document a one-time inspection of an additional 5% of the sample populations for Class 1, 2, and 3 piping supports. The additional supports will be selected from the remaining population of IWF piping supports and will include components that are most susceptible to age-related degradation. h) Augment existing procedures to specify that, for component supports with high-strength bolting greater than one-inch nominal diameter, volumetric examination comparable to that of ASME Code, Section XI,	Program one-time inspections begin 5 years before the SPEO. Inspections that are to be completed prior to the SPEO are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO. Program and SLR enhancements are implemented 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202

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			Table IWB-2500-1, Examination Category B-G-1 will be performed to detect cracking in addition to the VT-3 examination. A representative sample of bolts will be inspected during the inspection interval prior to the start of the SPEO and in each 10-year period during the SPEO. The sample will be 20% of the population (for a material / environment combination) up to a maximum of 25 bolts. i) Augment existing procedures to increase or modify the component support inspection population when a component is repaired to as-new condition by including another support that is representative of the remaining population of supports that were not repaired. j) Augment existing procedures to specify that the following conditions are also unacceptable: • Loss of material due to corrosion or wear; • Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support; and • Cracked or sheared bolts, including high-strength bolts, and anchors; and loss of material, cracking. k) If necessary based on related Structures Monitoring AMP evaluation results (of stainless steel cracking in the uncontrolled indoor and outdoor air at PSL), develop an augmented examination plan in accordance with IWF-2430 for a representative sample of stainless steel ASME Class 1, 2, or 3 supports as a separate part of the ASME Section XI, Subsection IWF AMP.		
34	10 CFR Part 50, Appendix J (19.2.2.31)	XI.S4	Continue the existing PSL 10 CFR Part 50, Appendix J AMP.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078
35	Masonry Walls (19.2.2.32)	XI.S5	Continue the existing PSL Masonry Walls AMP, including enhancement to: a) Revise the implementing procedure to monitor and inspect for gaps between the supports and masonry walls that could potentially impact the intended function or potentially invalidate its evaluation basis. b) Revise the implementing procedure to include specific monitoring, measurement, and trending of 1) widths and lengths of cracks in	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202

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			masonry walls and mortar joints, and 2) gaps between supports and masonry walls. c) Revise the implementing procedure to include specific guidance for the assessment of the acceptability of the widths and lengths of cracks in masonry walls and mortar joints and of gaps between supports and masonry walls to confirm that the degradation has not invalidated the original evaluation assumptions or impacted the capability to perform the intended functions.		RAI Response Set 2 ML22192A078
36	Structures Monitoring (19.2.2.33)	XI.S6	Continue the existing PSL Structures Monitoring AMP, including enhancements to: a) Monitor and inspect steel edge supports on masonry walls. b) Specify the use of high-strength bolt storage requirements discussed in Section 2 of the Research Council for Structural Connections publication, “Specification for Structural Joints Using High-Strength Bolts,” for structural bolting consisting of ASTM A325, ASTM A490, and equivalent bolts. c) Inspect concrete structures for increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation. d) Inspect elastomers for loss of material and cracking. e) Inspect stainless steel and aluminum components for pitting and crevice corrosion, and evidence of cracking due to SCC. f) Include monitoring and trending of leakage volumes and chemistry for signs of concrete or steel reinforcement degradation if active through-wall leakage or groundwater infiltration is identified. g) Specify that all bolting is monitored for loss of material, loose bolts, missing or loose nuts, and other conditions indicative of loss of preload. h) Include tactile inspection in addition to visual inspection of elastomeric elements to detect hardening. i) Include evidence of water in-leakage as a finding requiring further evaluation. This may include engineering evaluation, more frequent inspections, or destructive testing of affected concrete to validate existing concrete properties, including concrete pH levels. When	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202 RAI Response Set 2 ML22192A078

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			leakage volumes allow, assessment may include analysis of the leakage pH, along with mineral, chloride, sulfate, and iron content in the water. j) Develop a new implementing procedure or attachment to an existing implementing procedure to address aging management of inaccessible areas exposed to groundwater/soil and water-flowing. The document will include guidance to conduct a baseline visual inspection, pH analysis, and a chloride concentration test prior to the SPEO at a location close to the coastline/intake and a location in the main plant area for comparison. The baseline inspection results will be used to conduct a baseline evaluation that will determine the additional actions (if any) that are warranted. Additionally, the baseline evaluation results will set the subsequent inspection requirements and inspection intervals (not to exceed 5 years). Periodic inspections (focused) and evaluation updates (not to exceed 5 years) will be performed throughout the SPEO to ensure aging of inaccessible concrete is adequately managed. Opportunistic inspections may be used to replace or supplement the focused inspections if the inspection location is excavated for other reasons during the periodic inspection interval. k) Require inspections of the Condensate Storage Tank (CST) and Auxiliary Feedwater (AFW) Structures and Piping Inspections in the Trenches every third refueling outage, which will ensure that these inspections are performed at least once per 5 years. l) Include stainless steel ASME Class 1, 2, or 3 support members, welds, bolted connections, or anchorage in the engineering evaluation of acceptance criteria, expansion criteria, and examination frequency if cracking due to SCC in the uncontrolled indoor and outdoor air at PSL is detected for stainless steel mechanical or non-ASME structural components.		
37	Inspection of Water-Control Structures Associated with Nuclear Power Plants (19.2.2.34)	XI.S7	Continue the existing PSL Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP, including enhancement to: a) Revise the implementing procedure to reference EPRI Reports 1015336 and 1015337 and to incorporate guidance for proper selection of bolting material and lubricants and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high strength bolting. Additionally, procedures will be updated to explicitly prohibit the use of molybdenum disulfide and other lubricants containing sulfur on structural bolting.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202 RAI Response Set 2 ML22192A078

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			b) Revise the implementing procedure to specify the use of preventive actions for storage, lubricant selection, and bolting and coating material selection discussed in Section 2 of Research Council for Structural Connections publication, “Specification for Structural Joints Using High-Strength Bolts,” for structural bolting consisting of ASTM A325, ASTM A490, and equivalent bolts. c) Revise the implementing procedure to state that further evaluation of evidence of groundwater infiltration or through-concrete leakage may also include destructive testing of affected concrete to validate existing concrete properties, including concrete pH levels, and that assessments may include analysis of the leakage pH, along with mineral, chloride, sulfate, and iron content in the leakage water if leakage volumes allow. d) Revise the severe weather implementing procedure to include performance of structural inspections after major unusual events such as hurricanes, floods, or seismic events. e) Develop a new implementing procedure or attachment to an existing implementing procedure to address aging management of inaccessible areas exposed to groundwater/soil and water-flowing. The document will include guidance to conduct a baseline visual inspection, pH analysis, and a chloride concentration test prior to the SPEO at a location close to the coastline/intake and a location in the main plant area for comparison. The baseline inspection results will be used to conduct a baseline evaluation that will determine the additional actions (if any) that are warranted. Additionally, the baseline evaluation results will set the subsequent inspection requirements and inspection intervals (not to exceed 5 years). Periodic inspections (focused) and evaluation updates (not to exceed 5 years) will be performed throughout the SPEO to ensure aging of inaccessible concrete is adequately managed. Opportunistic inspections may be used to replace or supplement the focused inspections if the inspection location is excavated for other reasons during the periodic inspection interval. f) Revise the AMP and implementing procedure to more clearly reflect the following parameters monitored or inspected: • The intake cooling water canal earthen embankments are inspected for settlement, depressions, sink holes, slope stability (e.g., irregularities in alignment and variances from originally constructed slopes), seepage, and degradation of slope protection features.		

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			• The intake cooling water canal erosion protection, concrete paving & grout filled fabric are inspected for, loss of material, cracking, increase in porosity and permeability, loss of strength, loss of bond, distortion, and loss of form. • The emergency cooling canal is inspected for loss of form, loss of material, is monitored for sedimentation, debris, and instability of slopes that may impair the function of the canals under extreme low flow conditions. • Diver inspections include evidence of undercutting at the UHS dam.		
38	Protective Coating Monitoring and Maintenance (19.2.2.35)	XI.S8	Continue the existing PSL Protective Coating Monitoring and Maintenance AMP, including enhancement to: a) Ensure the implementing documents reference ASTM D5163-08 and clarify the parameter monitored to include blistering, cracking, rusting or physical damage. b) Ensure any follow-up inspections are performed by individuals trained and certified in the applicable reference standards of ASTM Guide D5498-12. c) Ensure inspections include the specific inspection and documentation parameters and observation and testing methods listed in ASTM D5163-08 subparagraph 10.2.1 through 10.2.6, 10.3, and 10.4. d) Ensure implementing documents reference the guidance of Regulatory Position C4 of RG 1.54 Revision 3.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078
39	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (19.2.2.36)	XI.E1	Continue the existing PSL Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (formerly the Containment Cable Inspection Program), including enhancement to: a) Review plant-specific OE for previously identified and mitigated adverse localized environments cumulative aging effects applicable to in-scope cable and connection electrical insulation during the original PEO. Evaluate to confirm that the dispositioned corrective actions continue to support in-scope cable and connection intended functions during the SPEO. b) If cable testing is deemed necessary, utilize sampling methodology consistent with guidance of Section XI.E1 of NUREG-2191.	Program inspections begin 10 years before the SPEO. Inspections that are to be completed prior to the SPEO are completed 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO.	SLRA Rev. 1 ML21285A110 SLRA Supplement 1 ML22097A202

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				Program and SLR enhancements are implemented 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	
40	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements used in Instrumentation Circuits (19.2.2.37)	XI.E2	Implement the new PSL Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110
41	Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (19.2.2.38)	XI.E3A	Implement the new PSL Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP including the following: a) Perform medium-voltage cable testing on lead-sheathed (submarine) cables, as a one-time test. b) Perform manhole inspections (containing medium-voltage cables in the program) for water accumulations, cable structural supports' integrity, sump pump operability verification, and manhole drainage path integrity on at least an annual basis. c) Perform manhole inspections (containing medium-voltage cables in the program) following a major water event for water accumulations, sump pump operability verification (and associated alarms), and manhole drainage path integrity. d) Inspection of manholes equipped with water level monitoring and alarms that result in consistent and subsequent pump out of accumulated water prior to wetting or submergence of cables can be performed at least once every five years, if supported by plant OE. Inspections of manholes with water level monitoring and alarms are also performed following event-driven occurrences if water accumulation is indicated by the monitoring system (e.g., frequent water level alarms).	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110
42	Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject	XI.E3B	Implement the new PSL Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP including the following:	No later than 6 months prior to the SPEO, or no later	SLRA Rev. 1 ML21285A110

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	to 10 CFR 50.49 Environmental Qualification Requirements (19.2.2.39)		a) Perform sample I&C cable visual inspection and tests (if necessary) at least every six years. b) Perform manhole inspections (containing I&C cables in the program) for water accumulations, cable structural supports' integrity, sump pump operability verification, and manhole drainage path integrity on at least an annual basis. c) Perform manhole inspections (containing I&C cables in the program) following a major water event for water accumulations, sump pump operability verification (and associated alarms), and manhole drainage path integrity. d) Inspection of manholes equipped with water level monitoring and alarms that result in consistent and subsequent pump out of accumulated water prior to wetting or submergence of cables can be performed at least once every five years, if supported by plant OE. Inspections of manholes with water level monitoring and alarms are also performed following event-driven occurrences if water accumulation is indicated by the monitoring system (e.g., frequent water level alarms).	than the last refueling outage prior to the SPEO i.e.: PSL1: 09/01/2035	SLRA Supplement 1 ML22097A202
43	Electrical Insulation for Inaccessible Low Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (19.2.2.40)	XI.E3C	Implement the new PSL Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP including the following: a) Perform periodic manhole inspections to prevent inaccessible in-scope low-voltage power cables from being exposed to water accumulations in low-voltage power cable manholes, vaults, and conduits and removing water, as needed, but at least once every year. Inspections are also to be performed after event-driven occurrences, such as heavy rain or flooding. Inspections include direct indication that cables are not wetted or submerged, and that cable/splices and cable support structures are intact. Dewatering systems (e.g., sump pumps and passive drains) and associated alarms are to be inspected, and their operation verified periodically. b) Perform periodic visual inspections of low-voltage power cables accessible from manholes, vaults, or other underground raceways for jacket surface abnormalities at least once every 6 years. c) Perform initial low-voltage power cable testing on a sample population to determine the condition of the electrical insulation. One or more tests may be required based on cable type, application, and electrical insulation material to determine the age-related degradation of the cable	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110

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			insulation. Inaccessible low-voltage power cables designed for continuous wetting or submergence are also included in this AMP. The need for additional periodic tests and inspections is determined by the test/inspection results as well as industry and plant-specific OE. d) Inspect manholes equipped with water level monitoring and alarms that result in consistent and subsequent pump out of accumulated water prior to wetting or submergence of cables at least once every five years, if supported by plant OE. Inspections of manholes with water level monitoring and alarms are also performed following event-driven occurrences if water accumulation is indicated by the monitoring system (e.g., frequent water level alarms).		
44	Metal Enclosed Bus (19.2.2.41)	XI.E4	Implement the new PSL Metal Enclosed Bus AMP	Implement AMP and complete initial inspections no later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110
45	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (19.2.2.42)	XI.E6	Implement the new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP.	Implement AMP and complete initial inspections no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110
46	High-Voltage Insulators (19.2.2.43)	XI.E7	Implement the new High-Voltage Insulators AMP.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110

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47	Pressurizer Surge Line (19.2.2.44)	N/A – PSL Site-Specific Program	Continue the existing PSL Pressurizer Surge Line AMP.	No later than 6 months prior to the SPEO, i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110 RAI Response Set 2 ML22192A078
48	Nonsafety-related SSCs that are not Directly Connected to Safety-related SSCs but have the Potential to Affect Safety- Related SSCs Through Spatial Interactions Screening Document	N/A	Minimize the potential for indoor abandoned equipment outside containment to leak or spray on safety-related equipment by performing the following: a) Update plant procedures to require the periodic venting and draining of indoor abandoned equipment located outside containment that is directly connected to in-service systems. b) Verify that abandoned equipment that is no longer directly connected to in-service systems is vented and drained.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110
49	Containment Structure and Internal Structural Components Aging Management Review	N/A	Follow the ongoing industry efforts that are clarifying the effects of irradiation on concrete and corresponding aging management recommendations, including: a) Evaluate their applicability to the PSL Unit 1 primary shield wall and associated reactor vessel supports. b) Update design calculations, as appropriate. c) Develop an informed site-specific program, if needed.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO i.e.: PSL1: 09/01/2035	SLRA Rev. 1 ML21285A110
50	Quality Assurance Program (19.1.3)	Appendix A	Continue the existing FPL QA Program at PSL.	Ongoing	SLRA Rev. 1 ML21285A110
51	Operating Experience Program (19.1.4)	Appendix B	Continue the existing PSL OE Program.	Ongoing	SLRA Rev. 1 ML21285A110
52	NA	NA	Continue replacement of the PSL Unit 1 EDG radiators on frequency of 6-years (not to exceed 6.5 years) during the SPEO. The PSL Unit 1 EDG radiator 6-year replacement frequency (not to exceed 6.5 years) can be modified during the SPEO based on additional site-specific and industry operating experience (OE) or implementation of design changes that increase the PSL Unit 1 EDG radiator life.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO i.e.: PSL1: 09/01/2035	RAI Response Set 4 Rev. 1 ML23111A129

APPENDIX B

CHRONOLOGY

B. Chronology

This appendix lists chronologically the routine licensing correspondence between the U.S. Nuclear Regulatory Commission (NRC) staff and Florida Power and Light Co. (FPL). This appendix also lists other correspondence under St. Lucie Nuclear Plant, Units 1, and 2 (St. Lucie or PSL) Docket Nos. 50-335 and 50-389 related to the staff's review of the St. Lucie subsequent license renewal application. These documents may be obtained online in the NRC's Agencywide Documents Access and Management System (ADAMS) Public Documents collection at https://www.nrc.gov/reading-rm/adams.html. To begin the search, select "Begin Web-based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov.

Table B-1 Chronology

Date	ADAMS Accession No.	Subject
3/17/2021	ML21076A314	St. Lucie Nuclear Plant, Units 1 and 2 (St. Lucie) Letter of Intent to Submit Application for Subsequent Renewed Facility Operating Licenses
3/17/2021	ML21076A315	St. Lucie, Submitted Exemption Request for Schedular Relief
5/11/2021	ML21127A218	NRC, Preapplication Meeting Summary (Safety)
6/29/2021	ML21176A055	NRC, Preapplication Meeting Summary (Safety)
7/9/2021	ML21173A292	NRC, Preapplication Meeting Summary (Environmental)
7/20/2021	ML21165A027	NRC, Exemption Request 10 CFR 54.17, Unit 2 Approval
8/3/2021	ML21215A315	St. Lucie, Subsequent License Renewal Application - Cover Letter
8/3/2021	ML21215A316	St. Lucie, Subsequent License Renewal Application – Enclosure 1 (Enclosures Summary)
8/3/2021	ML21215A317	St. Lucie, Subsequent License Renewal Application – Enclosure 2 (Proprietary Affidavits)
8/3/2021	ML21215A318	St. Lucie, Subsequent License Renewal Application – Enclosure 3 (Attachment 1 – Subsequent License Renewal Application)
8/3/2021	ML21215A319	St. Lucie, Subsequent License Renewal Application – Enclosure 3 (Attachment 2 – Environmental Report)
8/3/2021	ML21215A320	St. Lucie, Subsequent License Renewal Application – Enclosure 4 (Non-Proprietary Reference Documents)
8/3/2021	ML21215A322	St. Lucie, Subsequent License Renewal Application – Enclosure 5 (Proprietary Reference Documents)
8/3/2021	ML21215A314	St. Lucie, Subsequent License Renewal Application Package
8/10/2021	ML21217A195	NRC, Letter of Receipt and Availability of Subsequent License Renewal Application
8/10/2021	ML21217A196	NRC, Federal Registry Notice of Receipt and Availability of Subsequent License Renewal Application – 86 FR 45768
10/12/2021	ML21285A107	St. Lucie, Subsequent License Renewal Application Revision 1 Cover Letter

Date	ADAMS Accession No.	Subject
10/12/2021	ML21285A108	St. Lucie, Subsequent License Renewal Application Revision 1 Enclosure 1 (Enclosures Summary)
10/12/2021	ML21285A109	St. Lucie, Subsequent License Renewal Application Revision 1 Enclosure 2 (Proprietary Affidavits)
10/12/2021	ML21285A110	St. Lucie, Subsequent License Renewal Application Revision 1 Enclosure 3 (Attachment 1 (Public Version))
10/12/2021	ML21285A111	St. Lucie, Subsequent License Renewal Application Revision 1 Enclosure 3 (Attachment 2 -Environmental Report)
10/12/2021	ML21285A112	St. Lucie, Subsequent License Renewal Application Revision 1 Enclosure 4 (Non-Proprietary Reference Documents)
10/12/2021	ML21285A123	St. Lucie, Subsequent License Renewal Application Revision 1 Enclosure 5 (Proprietary Reference Documents)
10/12/2021	ML21285A106	St. Lucie, Subsequent License Renewal Application Revision 1 Package
4/7/2022	ML22097A202	St. Lucie, Subsequent License Renewal Revision 1 – Supplement 1
4/13/2022	ML22103A014	St. Lucie, Subsequent License Renewal Revision 1 – Supplement 2
5/12/2022	ML22133A001	NRC, Subsequent License Renewal Application RAI Set # 1
5/19/2022	ML22139A083	St. Lucie, Subsequent License Renewal Revision 1 – Supplement 3
5/26/2022	ML22147A087	NRC, Subsequent License Renewal Application RCI Set # 1
6/8/2022	ML22160A367	NRC, Subsequent License Renewal Application RAI Set # 2
6/13/2022	ML22164A802	St. Lucie, Subsequent License Renewal Application RAI Set # 1 Responses
7/7/2022	ML22188A086	NRC, Subsequent License Renewal Application Audit Report
7/11/2022	ML22193A085	NRC, Subsequent License Renewal Application RAI Set # 3
7/11/2022	ML22192A078	St. Lucie, Subsequent License Renewal Application RAI Set # 2 Responses
8/9/2022	ML22221A134	St. Lucie, Subsequent License Renewal Application RAI Set # 3 Responses
9/8/2022	ML22251A202	St. Lucie, Subsequent License Renewal Application Second Round RAI #1 Response
9/22/2022	ML22265A134	St. Lucie, Subsequent License Renewal Revision 1 – Supplement 4
11/18/2022	ML22322A037	NRC, Revised Schedule Letter
11/18/2022	ML22325A067	NRC, Subsequent License Renewal Application RAI Set # 4
2/17/2023	ML23045A077	NRC, Public Meeting Notice (Safety)
3/27/2023	ML23086B990	St. Lucie, Subsequent License Renewal Application RAI Set # 4 Responses
4/21/2023	ML23111A129	St. Lucie Nuclear Plant, Units 1 and 2, Subsequent License Renewal Application - Aging Management Requests For Additional Information (RAI) Set 4 Supplemental Response

Date	ADAMS Accession No.	Subject
4/30/2023	ML23109A113	St. Lucie Plant, Units 1 and 2 – Schedule Revision for the Subsequent License Renewal Application Review
6/14/2023	ML23165A114	St. Lucie, Subsequent License Renewal Revision 1 – Supplement 5
7/13/2023	ML23194A211	St. Lucie, Subsequent License Renewal Revision 1 – Supplement 6

APPENDIX C

PRINCIPAL CONTRIBUTORS

C. Principal Contributors

This appendix lists the principal contributors for the development of this safety evaluation and their areas of responsibility.

Table C-1 Principal Contributors

Name	Area of Responsibility
Allik, Brian	Reviewer—Mechanical and Materials
Alvarado, Lydiana	Reviewer—Mechanical and Materials
Anchondo-Lopez, Isaac	Reviewer—Mechanical and Materials
Atkinson, Deion	Project Manager
Bloom, Steve	Management Oversight
Burton, Mat	Reviewer—Mechanical and Materials
Buford, Angela	Management Oversight
Cintron, Jorge	Review—Electrical
Chien, Nan (Danny)	Reviewer—Mechanical and Materials
Colaccino, Joseph	Management Oversight
Collins, Jay	Reviewer—Mechanical and Materials
Davis, Robert	Reviewer—Mechanical and Materials
Dean, Jeremy	Reviewer—Mechanical and Materials
Dinh, Thinh	Reviewer — Scoping and Screening Methodology
Dijamco, David	Reviewer—Mechanical and Materials
Fairbanks, Carolyn	Reviewer—Mechanical and Materials
Foli, Adakou	Review—Electrical
Fu, Bart	Reviewer—Mechanical and Materials
Gardner, William (Tony)	Reviewer—Mechanical and Materials
Gavula, James	Reviewer—Mechanical and Materials
Gibson, Lauren	Management Oversight
Harris, Brian	Project Manager
Hammock, Jessica	Project Manager
Hernandez, Raul	Reviewer—Mechanical and Materials
Hiser, Allen	Senior Technical Advisor
Iqbal, Naeem	Reviewer—Scoping and Screening Methodology
Istar, Ata	Reviewer—Structural
James, Lois	Project Manager
Jenkins, Joel	Reviewer—Mechanical and Materials
Johnson, Andrew	Reviewer—Mechanical and Materials
Johnson, Marieliz	Project Manager
Johnston, Jeanne	Management Oversight
Jones, Steve	Reviewer—Mechanical and Materials
Kalikian, Var	Reviewer—Mechanical and Materials
Klein, Paul	Reviewer—Mechanical and Materials
Kodali, Hari	Review—Electrical
Krepel, Scott	Management Oversight
Lehman, Bryce	Reviewer—Structural
López, Juan	Reviewer—Structural

Name	Area of Responsibility
Lukes, Robert	Management Oversight
Makar, Gregory	Reviewer—Mechanical and Materials
Matharu, Gurcharan (Singh)	Review—Electrical
McConnel, Matthew	Review—Electrical
Medoff, James	Reviewer—Mechanical and Materials
Min, Seung	Reviewer—Mechanical and Materials
Mitchell, Matthew (Matt)	Management Oversight
Nguyen, Duc	Reviewer—Electrical
Nold, David	Reviewer—Mechanical and Materials
Paige, Jason	Management Oversight
Platt, Samantha	Reviewer—Mechanical and Materials
Pratt, David	Reviewer—Mechanical and Materials
Prinaris, Andrew	Reviewer—Structural
Ramadan, Liliana	Review—Electrical
Reichelt, Eric	Reviewer—Mechanical and Materials
Rezai, A	Reviewer—Mechanical and Materials
Rogers, Bill	Project Manager; Reviewer—Scoping and Screening Methodology
Rudland, David	Senior Technical Advisor
Scully, Derek	Reviewer—Mechanical and Materials
Sida, Karen	Reviewer—Mechanical and Materials
Smith, Brian	Management Oversight
Stubbs, Angelo	Reviewer—Mechanical and Materials
Terry, Leslie	Reviewer—Mechanical and Materials
Thomson, Bernie	Management Oversight
Thomas, George	Reviewer—Structural
Thomas, Vaughn	Project Manager
Tyree, Christopher	Project Manager
Tsao, John	Reviewer—Mechanical and Materials
Wang, George	Reviewer—Structural
Whitman, Jennifer	Management Oversight
Wittick, Brian	Management Oversight
Wyman, Steve	Management Oversight
Wood, Kent	Reviewer—Mechanical and Materials
Woodyatt, Diana	Reviewer—Mechanical and Materials
Xi, Zuhan	Reviewer—Structural
Yoder, Matthew	Reviewer—Chemical
Yee, On	Reviewer—Mechanical and Materials
Young, Austin	Reviewer—Mechanical and Materials

APPENDIX D

REFERENCES

D. References

This appendix lists the references used throughout this safety evaluation for review of the St. Lucie Plant, Units 1 and 2, subsequent license renewal application.

Table D-1 References

References
U.S. Nuclear Regulatory Commission (NRC)
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Title 10 *Code of Federal Regulations*, Section §50.48 (10 CFR 50.48), "Fire Protection"
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Title 10 *Code of Federal Regulations*, Section §50.61 (10 CFR 50.61), "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events"
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SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance," February 2021 ML20181A434)
SLR-ISG-2021-01-PWRVI, "Updated Aging Management Criteria for Reactor Vessel Internal Components in Pressurized-Water Reactors," January 2021 (ML20217L203)
SLR-ISG-2021-03-STRUCTURES, "Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance" February 2021 (ML20181A381)
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